

**Hidden Density**  
A Proposal for Single-Family Infill Housing

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## Abstract

In the recent past, there has been a shift in user preferences toward walkable, urban neighborhoods. The highest housing prices are now found in dense metropolitan areas rather than wealthy suburbs and this trend is expected to continue with the growth of Generation Y and the return of Baby Boomers to urban areas. According to the 2010 Census, over 80 percent of Americans now live in urban areas.

Furthermore, awareness around sustainability has become an issue at the forefront of city planning and the built environment. Methods for reducing our carbon footprint and creating healthier, more livable spaces are gaining political traction. These changes have become integral in the way we design buildings, as well as how users occupy their spaces.

Despite this, many people still prefer detached housing units but find that it is becoming less realistic in urban environments in which density is now valued. Methods for retaining the single-family character of neighborhoods are now being developed in several western cities (Vancouver, Seattle, Portland, Austin). Each has implemented accessory dwelling unit (ADU) programs that allow homeowners to construct compact attached or detached backyard homes. The benefits of these programs are clear: more affordable units, increased population density to achieve more economical transit and more walkable neighborhoods. However, implementation has proven difficult for a variety of reasons. Perhaps foremost among them is that most individual families do not have the means to build or oversee a project of this complexity.

In order to address the growing need for affordable rental units, changing demographics and a space market heavily stocked with single-family homes, the City of Seattle needs to reassess the core principles of its ADU program and focus on developing strategies and methods to encourage this type of hidden density.

## TABLE OF CONTENTS

- I. URBAN DENSITY and MICROECONOMICS
- II. SMART GROWTH
- III. INFILL DEVELOPMENT
- IV. VANCOUVER CASE STUDIES
- V. NEIGHBORHOOD SELECTION
- VI. ENTITLEMENTS
- VII. BUILDING DESIGN
- VIII. ALLEY DESIGN
- IX. CONSTRUCTION
- X. DEVELOPMENT POTENTIAL
- XI. FINANCIAL FEASIBILITY
- XII. CONCLUSION

## I. Urban Density and Microeconomics

The mid-20<sup>th</sup> century saw an exodus of residents from urban centers to suburban areas. Construction of the interstate highway system facilitated the sprawl of home development from the city center and shifted the tax base away from the city. However, after decades of population decline and deterioration, cities have regained their dominance. It is now estimated that more than 80 percent of people live in cities, particularly due to the changing preferences of Millennials and Baby Boomers.

The Puget Sound Regional Council has projected that by 2040, Snohomish, King, Kipsap and Pierce Counties will grow by 1.7 million people. At least 200,000 of those residents are expected to settle in Seattle, increasing its population by about 30 percent. According to the U.S. Census, in 2013 Seattle had the fastest rate of growth among the fifty most populous U.S. cities. Seattle added 18,000 new residents in that time, a rate that if continued, would mean an additional 450,000 residents over the next 25 years.

The era of a sleepy Seattle with billboards asking, “will the last person leaving Seattle turn out the lights?” is long past. What has driven Seattle’s recent growth? Several key factors contribute to the success of a region and provide the framework for its prosperity: employment growth, population growth, and income growth.



### **Employment Growth**

The Seattle metropolitan area has recorded annualized employment growth of 3.2 percent, ranking it second among all major west coast markets, only slightly behind San Jose (3.38 percent). On average, excluding the recent recessions, King County has seen employment growth of just over 2 percent annually. The County is home to eight Fortune 500 companies, three of which are flag-shipped in Seattle. From 1970 onward, King County has seen a staggering employment growth of 168 percent, and its strong employment base is expected to drive growth in the future.

### **Population Growth**

Population growth, often considered the bellwether for housing demand, has historically been very strong in Seattle. Since 1972, population growth has been positive despite five recessions over that time period. In the past decade, population growth has been near 1.2 percent (21,700 people per year). This figure is expected to decline slightly over the next five years, but remain strong at 0.8 percent growth annually.

### **Income Growth**

Income is another market fundamental that drives housing demand and is also expected to increase in the coming years. In 2013, average incomes were \$97,421, an increase of 1.8 percent since 2010. By 2018, this figure is expected to increase 13.3 percent to \$110,409. This is due in part to King County's highly educated population. 16.9 percent of the population holds a graduate degree and 28.7 percent hold a bachelor's degree. Trends suggest that education qualifications lend themselves to more rapid income growth and thus, King County is expected to grow at a faster rate than the United States average.



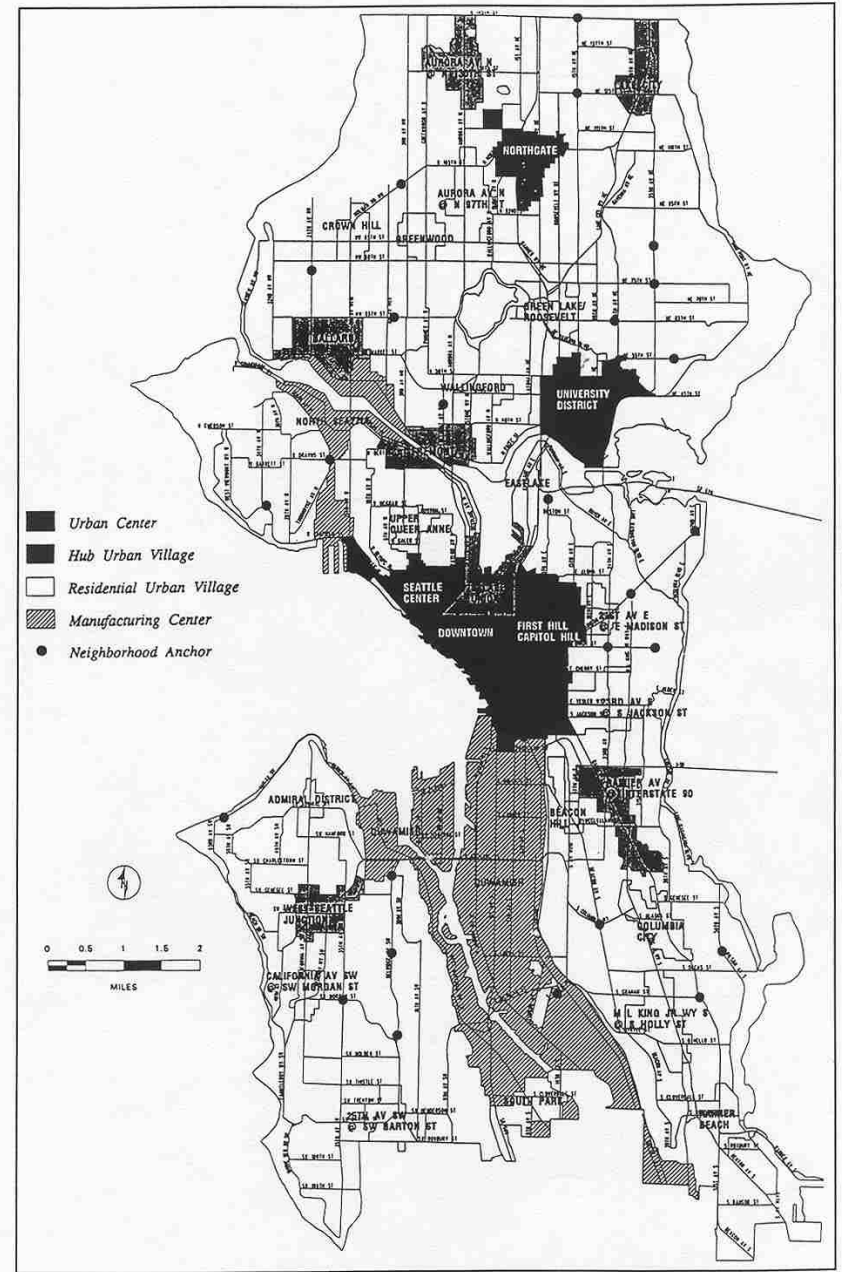
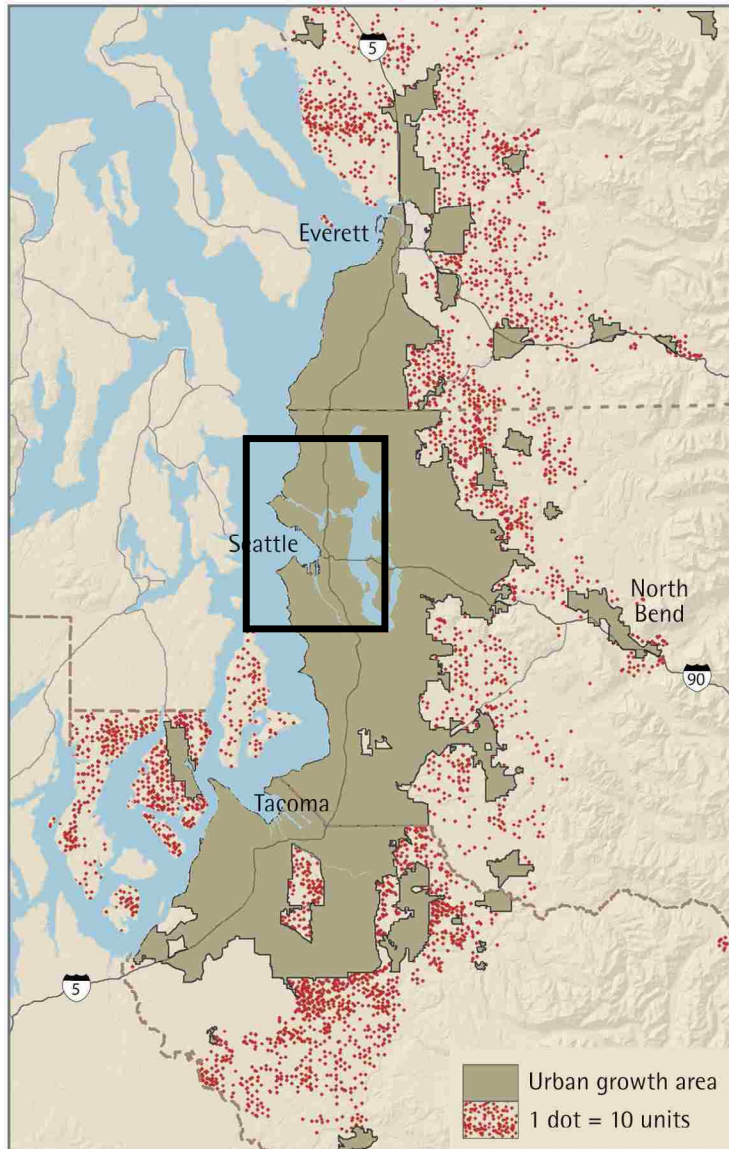


FIGURE 8. Seattle urban villages strategy  
Source: Seattle Planning Department 1993



## II. Smart Growth

In anticipation of this continued population inflow, planners have implemented strategies at the state and local levels to accommodate this growth.

In the Pacific Northwest, the Washington State Growth Management Act was established in 1990 as an attempt to reduce sprawl by regulating the areas where urban growth could legally occur. An Urban Growth Boundary was designated and urban development is only permitted inside the boundary. This was in direct response to the problems of suburban sprawl and an attempt to thwart the effects of climate change. Furthermore, it allowed state governments to retain areas with rich agricultural soils and protect the natural habitats of the Cascadia region.

On a local level, the City of Seattle also made plans for how to handle the bulk of their urban growth. In the mid-2000s, Seattle implemented an Urban Village policy, which directed the majority of density to areas with vibrant mixed-used neighborhoods, or those with the capacity for such. This strategy is separated into four categories: urban centers, manufacturing/industrial centers (MIC), hub urban villages, and residential urban villages. In all, the cumulative landmass of the areas included in the Urban Villages policy totals only 19 percent of the city's land, preserving over 60 percent for single-family land use.



### III. Infill Development

Historically, increased density has been achieved through upzoning and the development of duplexes and large multi-family buildings. Oftentimes this has been met with class opposition: citizens have fought to keep low-rise, single-family neighborhoods in their traditional models. With the advent of the accessory dwelling unit (ADU), a “hidden density” that circumvents class opposition can be achieved.

#### History of ADUs

Shortly after the implementation of the Growth Management Boundary, the Washington State legislature, in a response to rising housing costs and increasingly limited housing availability, required that communities develop ADU legislation. ADUs adhere to many of the goals outlined in the comprehensive plan, which encourages infill developments while protecting single-family homes, as well as encouraging “ground-related” housing, creating a mix of housing types that are affordable to a diversity of residents, and solutions that provide a more efficient use of land resources.

ADU legislation allows any qualified homeowner to construct an attached or detached backyard home on their property. ADUs are compact, self-contained dwelling units, located on the same lot as an existing residential property. These units can provide additional square footage for the primary residents, living space for family or friends, or can function as a rental property with the potential for generating additional income. They are often connected to a garage, or can exist as a stand-alone cottage (commonly referred to as an in-law unit). Attached ADUs (AADU) can be no more than 1,000-square feet and detached ADUs (DADU) can be no more than 800 square feet. The structures cannot consume more than 40 percent of the rear yard and the total combined occupancy of the main unit and the ADU must not exceed eight individuals.

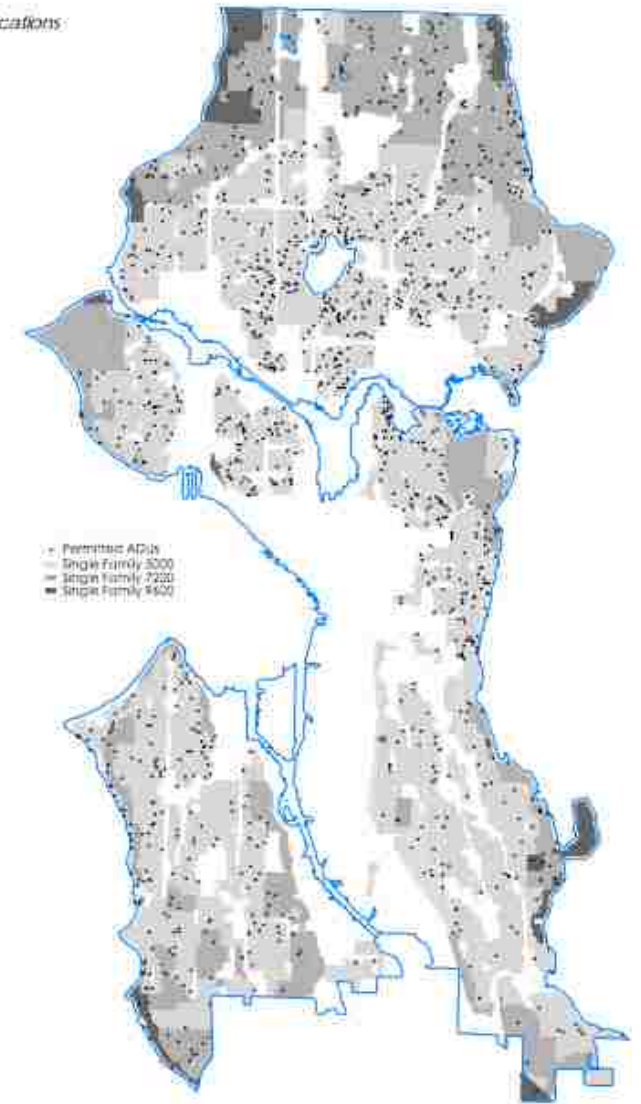
In Seattle, a city with over 60 percent of land zoned for single-family use (SF5000, SF7200, SF9600), accessory dwelling units should have been an obvious solution. However, the city was slow to implement, concerned that neighbors would oppose this type of development. The jurisdiction began with a pilot program in 2006, focusing only on a limited area in southeast Seattle (east of I-5, south of I-90). Despite initial concerns, the pilot program was successful and in 2009, the Seattle City Council adopted legislation permitting accessory dwelling units throughout all single-family and low-rise zones.

However, the implementation and development of these units has been scarce. Across Seattle, only 1 percent of single-family homeowners have opted to develop an ADU on their property. Seattle has approximately 120,000 single-family parcels and has permitted between 100-175 attached accessory dwelling units (AADU) and about 50 detached accessory dwelling units (DADU) per year. By comparison, the city receives about 300 permits for new single-family homes each year.

### Benefits

In terms of urban housing goals, ADUs meet a variety of the objectives. In wealthier neighborhoods they provide affordable housing options, thus allowing for greater economic diversity. They also help to increase population density with minimal impact on the character of existing neighborhoods. Furthermore, given the decreased costs of land and infrastructure, the cost per unit is lower than new multi-family development, in turn allowing for a more affordable housing option.

Figure 7. ADU Permit Applications  
Issued 1994 - July 2003





GREEN ECONOMY



INCREASED TRANSIT CAPACITY  
MORE HOUSEHOLDS SERVICED BY TRANSIT



LOW IMPACT DENSITY  
MAINTAIN NEIGHBORHOOD CHARACTER



ALTERNATE HOUSING OPTIONS  
AFFORDABLE HOUSING  
ACCESS TO DESIREABLE NEIGHBORHOODS



EXISTING INFRASTRUCTURE  
NO ADDITIONAL LAND OR PUBLIC ROADS NEEDED



MULTI-GENERATIONAL HOUSING OPTIONS  
SOCIAL EQUITY IN ELDERLY HOUSING



ACTIVATE COMMUNITY  
ADDITIONAL AMENITIES



FINANCIAL FLEXIBILITY FOR HOMEOWNERS  
MONTHLY CASH-FLOW  
INCREASED PROPERTY VALUE  
LOWER COSTS THAN NEW CONSTRUCTION

In addition, ADU development has major environmental impacts including lower carbon emissions, increased efficiency of infrastructure, healthier occupants, etc. One example of system efficiencies relates to the impact on public transit systems. The key metric used by public transportation and planning organizations is dwelling units per acre. Thus, by adding housing units and increasing population, the propensity for more frequent and more diverse transit systems greatly increases. The Institute of Transportation Engineers concluded that systems with higher population density, accessibility, and accommodating land-use patterns are more successful and better suited for transit.

Furthermore, as with any type of infill development, building in developed areas lowers costs related to street improvements, utilities, and infrastructure (Carbon Efficient City, Hurd and Hurd). No additional land or public roads are needed, and utilities are often already in place or easily accessible. This saves on cost, materials and labor.

#### ITE Bus Transit Baselines

Level of Service	Transit Frequency	DUA (Dwelling Units/Acre)	Gross Population (p/sqmi)	Non-residential
Minimum	60 mins	4-5 units	3,000 - 4,000 people	5-8 million SF
Intermediate	30 mins	7 units	5,000 - 6,000 people	8-20 million SF
Frequent	10 mins	15 units	10,000 people	20-50 million SF

<http://www.tjpd.org/transportation/report.asp?docID=24>



## Challenges

While there are many positive benefits attributed to the development of ADUs, there are some challenges as well. Prior to having any experience with ADUs, the major concerns included: traffic increases, parking inadequacies, privacy and quality of design. To determine whether or not these concerns were based on perception or reality, the City of Seattle interviewed inhabitants of ADU units, homeowners and neighboring residents.

Given that single-family homes are already being rented out to maximize capacity, ADUs were not found to increase the number of street cars. In fact, research shows that the presence of ADUs helped to alleviate regional traffic congestion by creating more housing choices within the city, with closer proximity to jobs, transit and services.

In terms of parking, the majority of ADUs require an offsite parking spot, except in areas that have been designated an Urban Village or Urban Center. Other exceptions are made for sites with extreme slopes, small lots or other extenuating circumstances.

The final two concerns were a bit more subjective, but overall were shown to have little or no negative impacts on the neighborhood. Privacy concerns have for the most part been addressed by the development standards and building codes (most notably through setback requirement from size and rear lots). While perceptual impacts have largely driven this concern, in actuality, no increase in impacts on privacy are anticipated beyond what could viably occur with a house addition or new home construction. Along the same lines, design quality is addressed within the development standards and controls the height, scale and finishes in order to maintain the character of existing neighborhoods.

To better understand their impact, in 1998, Seattle's City Council organized an Innovative Housing Design demonstration that tested and evaluated a variety of residential ADU design concepts. Professionals evaluated individual units and neighbors located within 300 feet of newly constructed ADUs completed surveys. Overall, results were overwhelmingly positive. Furthermore, studies of the first 10 years of ADU permit requests showed widespread interest across a diversity of neighborhoods. (See map on page 12.)

What then, was discouraging the implementation of this new housing type? One reason seemed to be that many homeowners did not want the responsibility of hosting tenants on their property. However, the most dominant reason was shown to be the difficulty in maneuvering the legal approvals necessary for development. The study below aims to simplify the process for homeowners, but shows the complexity that exists in the regulation.

THE ADU GAUNTLET: SELECTED RESTRICTIONS AND REQUIREMENTS FOR ACCESSORY DWELLING UNITS (ADU) IN CASCADIAN CITIES, EARLY 2013.

(Attached units, such as secondary suites and in-law apartments = AADUs; detached units, such as laneway houses and backyard cottages = DADUs.)

Please help us fact check and fill in the blanks!

CITIES	NUMBER OF ADUs ALLOWED PER LOT	OFF-STREET PARKING SPACES REQUIRED PER ADU	MUST PROPERTY OWNER LIVE ON THE SITE?	HOW MANY PEOPLE MAY LIVE ON THE LOT?	HOW BIG MAY ADUs BE? (IN FLDOR AREA)	WHERE IN THE CITY ARE ADUs ALLOWED?	MUST ADU MATCH HOUSE IN EXTERIOR DESIGN?	CITY POPULATION	ADU-FRIENDLINESS SCORE (0-100)
Vancouver, BC	1 AADU + 1 DADU	0	no	Each unit gets its own occupancy quota (e.g., ≤5 unrelated persons in each unit).	AADUs: >400 sq. ft. and same of primary dwelling. (Smaller permitted in condo AADUs.) DADUs: 280 + 500 sq. ft. (plus 220 sq. ft. garage, which most residents use as living space); and ≤12.5% of lot.	AADUs in virtually all residential zones, even inside condos, where space and layout permit. DADUs: most single-family lots in city (including lots >33 ft. wide that adjoin lanes/alleys).	no	643,000	96
Seattle, WA	1	1	yes	Units share one occupancy quota (≤8 in both units, if any, unrelated).	AADUs ≤1,000 sq. ft.; DADUs <800 sq. ft. and >40% of rear yard.	Most residential zones, but lot and unit size and characteristics must fit requirements. DADUs: sites >4,000 sq. ft. and ≥25 ft wide and ≥75 ft deep.	no	608,660	58
Portland, OR	1	0	no	Units share one occupancy quota (≤6, if unrelated).	<800 sq. ft. and <75% of primary unit. ADU & other accessory structures (such as garage, shed) cover ≤15% of total site.	All lots in residential zones with a house, attached house, or manufactured home.	yes	583,776	72
Surrey, BC	1	1	yes	Surrey has no occupancy limits.	≤960 sq. ft. and <40% of primary unit. ADU attached to garage (coach house): ≤500 sq. ft. above garage and ≤430 sq. ft. at grade.	AADUs in detached single-family houses in certain zones. DADUs in certain zones, on lots with detached single-family houses that are either corner lots or have rear laneway access and are ≥35 ft. deep.	Usually no, but yes in some zones.	468,000	47
Burnaby, BC	1 AADU (but only for family members); 0 DADUs	0	no, but occupants must be related	3 unrelated in main dwelling + 2 adults in ADU, must be related to persons living main dwelling	No size limit.	In single-family and two-family dwellings in most residential zones. Also permitted inside some condos.	Not applicable because DADUs banned.	223,000	35
Spokane, WA	1	1	yes	Both units share one occupancy quota (≤6, if any unrelated)	AADU: 250 + 800 sq. ft., not counting its garage; and ≤50% of total footprint of primary dwelling. DADU: Footprint of DADU ≤ footprint of primary dwelling. Combined footprint of all detached accessory structures (e.g., DADU + garage) ≤15% of lot. DADUs: ≤600 sq. ft. and DADUs area, minus its garage, counts toward floor-area ratio allowed in its zone.	On all residential lots with attached, detached, or manufactured single-family dwellings that lack a home-based business. In addition, AADUs allowed only where footprint of primary unit is ≥800 sq. ft., not counting garage.	yes	208,916	41
Boise, ID	1	1	yes	Each unit gets its own occupancy quota (e.g., ≤5 unrelated persons in each unit)	ADU ≤10% of lot and ≤600 sq. ft. and ≤1 bedroom.	All lots in residential zones.	yes	206,000	43
Tacoma, WA	1	1	yes	≤4 people in ADU. Also, as for other single-family dwellings, must have ≥300 sq. ft. per person. (This rule makes real limit ≤3 people, because no ADU can be >7,000 sq. ft.)	300 + 1,000 sq. ft. and ≤40% of combined area of primary and accessory unit and ≤10% of lot.	Residential lots with detached single-family houses that meet minimum lot size requirement of their zone. In R-2 zone, e.g., lot ≥5,000 sq. ft.	yes	198,000	38

#### IV. Vancouver Case Studies

To help inform the design and financial options for an ADU in Seattle, the most successful program of this type, in neighboring Vancouver, B.C., was studied. The City of Vancouver has two options in place to add density to its laneways: coach housing and laneway housing. Aesthetically and functionally, the two housing types are very similar, but differ in terms of zoning and ownership. Laneway houses are the most similar to the Seattle accessory dwelling unit program; they exist in single-family zones and are tied to the owner of the land. Due to this, the construction of a laneway house increases the value of the improvements, but does not affect the value of the land. In contrast, coach houses are built in multi-family zones and may be sold by strata (similar to a condo sale), thus increasing the value of both the land and the improvements. Code stipulates that the existing units on the plot be upgraded to current code if a coach house and strata option is pursued. Very often the city is seeing these opportunities being undertaken by professional developers.

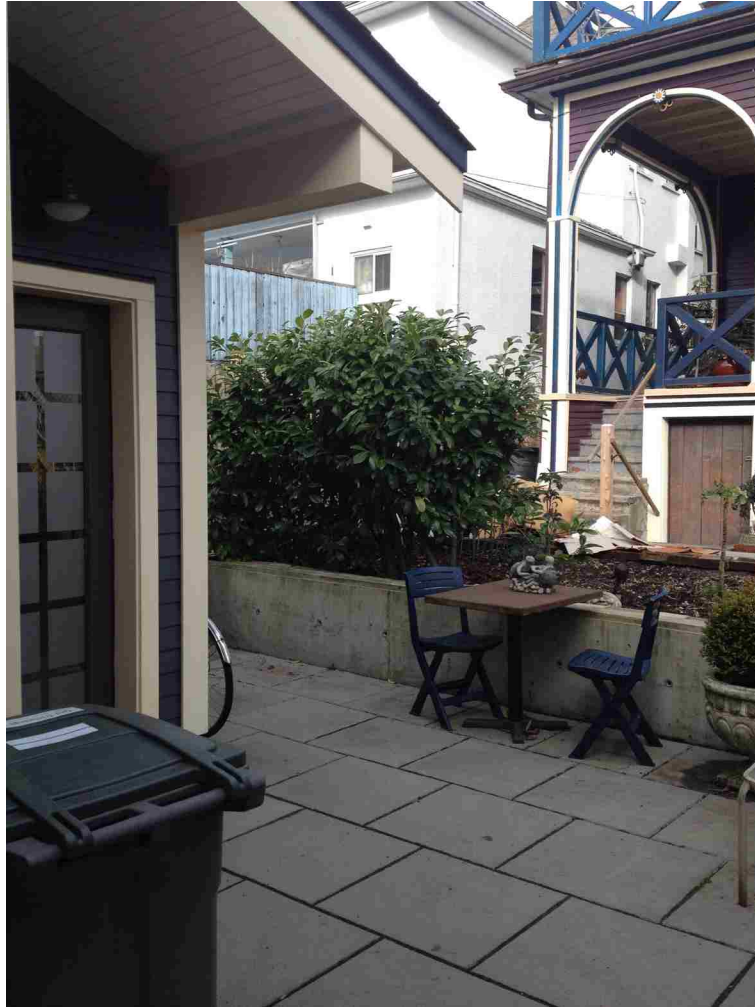
The laneway housing program began in 2009 and has been widely adopted across all areas of the city. Over the past five years, 1100 permits have been issued and 700-800 have been completed to date. Two-thirds of these were redevelopments, that is, pre-existing structures that were brought up to code and legally permitted. The city has also acknowledged that due to economies of scale, they are unable to inspect all aspects of each project with as much rigor as they would for a large-scale development project. Due to this, well-intentioned code requirements such as alley landscaping, while not having been removed from the code, are oftentimes not being followed.

### **Code Adjustments**

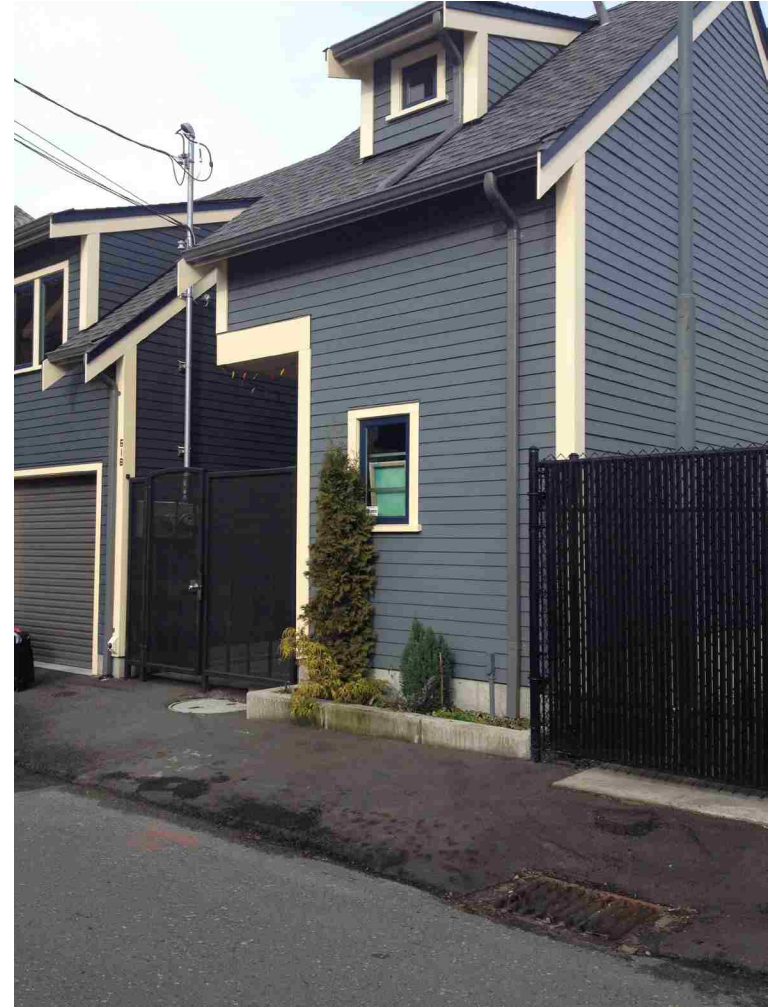
At the onset of the program, the city carefully monitored the concerns of neighbors and builders. Building massing, floor area allotments and parking were the main issues that arose. Adjustments were made to the building massing, specifically restricting the allowable area on the upper level. This was an issue brought up by neighbors concerned with view corridors and scale. At the same time, the City received feedback from owners and architects regarding FAR allotments not being adequate to achieve the necessary function. Finally, changes were made to the parking requirement, which had been set at one covered parking space per unit. Neighbors complained that occupants of the laneway homes were parking on the street and using their indoor garages as living space. Now the code requires at least one outdoor parking space on the premises.

### **City Services**

One of the main benefits of providing infill housing is the ability to tap into existing services and infrastructure in established neighborhoods. In most scenarios this equates to cost savings but certain aspects of laneway housing are more complex. For example, fire services are not expected to travel down laneways in the case of an emergency or fire. Therefore, despite laneway houses being required by code to be “oriented to the lane,” they must also provide access to the frontage street alongside the main house. More substantially, the City of Vancouver (similar to the City of Seattle) is upgrading its storm and sewer drainage systems. The old system utilized one pipe for all waste and is now being separated. This is not an inexpensive improvement and building of new laneway houses must comply with the new rules. Oftentimes, this means paying for the cost of running separated piping down the alleyway.



Mixed Use Coach House  
Vancouver, BC











Laneway Housing  
Vancouver, BC

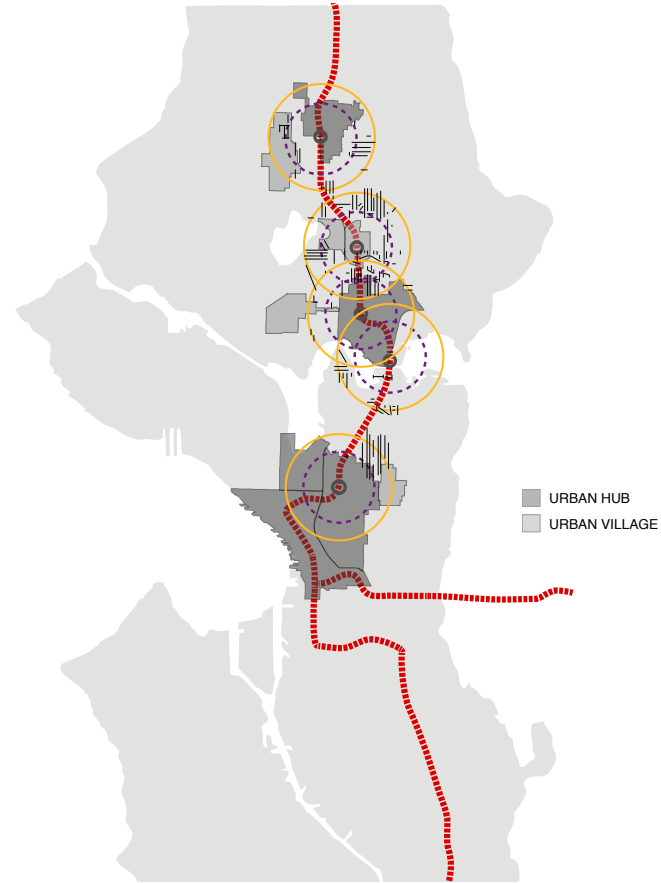
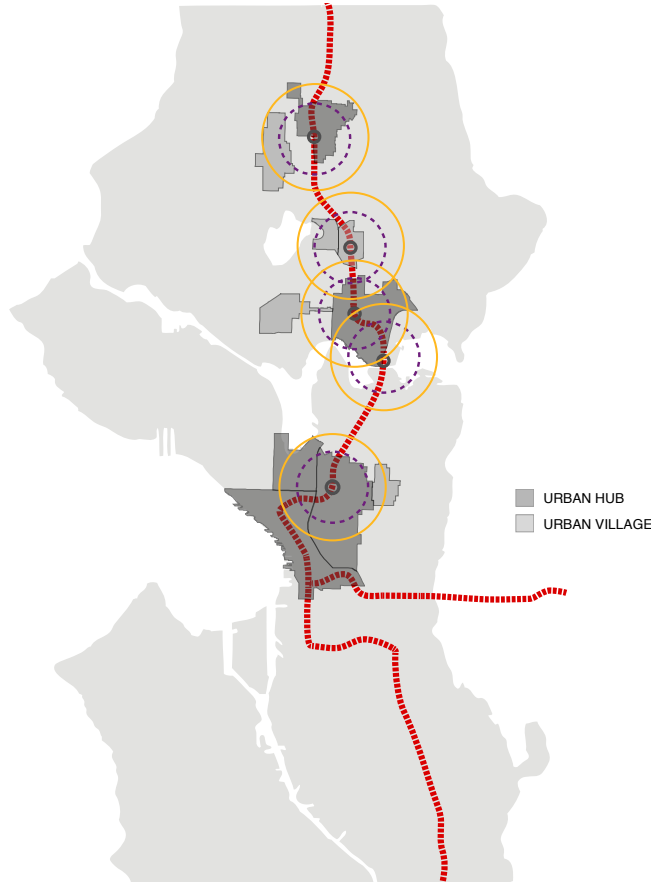
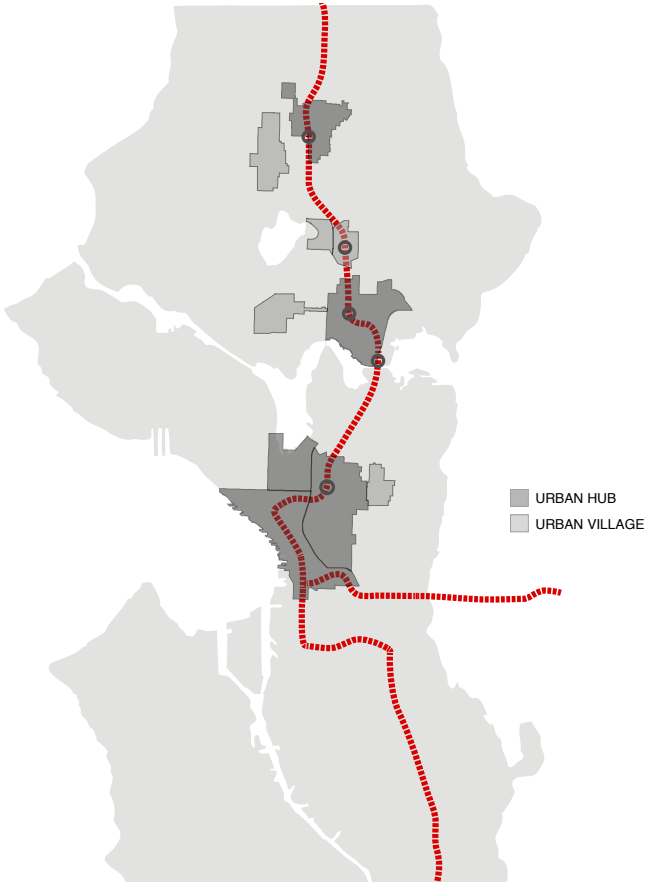
## V. Neighborhood Selection

*“Few forces are more consequential for the shape of cities than are a society’s investments in transportation infrastructure.” -Nivola “Fat City”*

The economic health of a metropolitan area is influenced largely by its transportation infrastructure. Transportation influences patterns of growth and economic activity by heightening the mobility of people and goods while providing access to land. It influences public policy factors such as air quality, social equity, resource consumption, sustainability, safety, and quality of life. Due to its substantial impact, transportation infrastructure was regulated several decades ago by local planning authorities across the United States. However, in the US only 1.5 percent of GDP goes toward infrastructure with less than 4 percent going toward rail projects. Looking at the areas seeing the most rapid urban densification, 80 percent are served by rail.

The real estate community has recently begun to embrace transit-oriented development (TOD), which focuses on high-density, mixed-use buildings that facilitate walkable communities and the use of public transportation. The public sector has always encouraged this type of development because it allows jurisdictions to leverage investments in public transit as well as public infrastructure improvements such as sidewalks and sewers. Developers have also embraced this approach, assuming they are able to increase density on the project, in turn allowing for per-unit cost savings. With the development of the Link Light Rail system, new opportunities for transit-oriented development have appeared across the Seattle Metropolitan Area.

Urban Center and Urban Village designations, as well as specific Station Area Overlay Zones, have been applied to each of the new light rail stations. This allows for greater densities in areas close to transit. There are however, many streets within walking and biking distance still zoned for single-family homes. These areas provide the greatest potential for the incremental density approach that accessory dwelling units provide.



The City of Seattle currently has construction and development underway for the North Link rail line, an extension of the existing Central Link system. The first segment connects the University District and Capitol Hill to the terminus of the previously completed system in the CBD. The second segment connects the University District, Roosevelt and Northgate neighborhoods. Respectively, the two segments are expected to come online in 2016 and 2021. The impacts of these impending improvements have not been fully recognized by the real estate community, so the time is ripe for property acquisition and redevelopment.

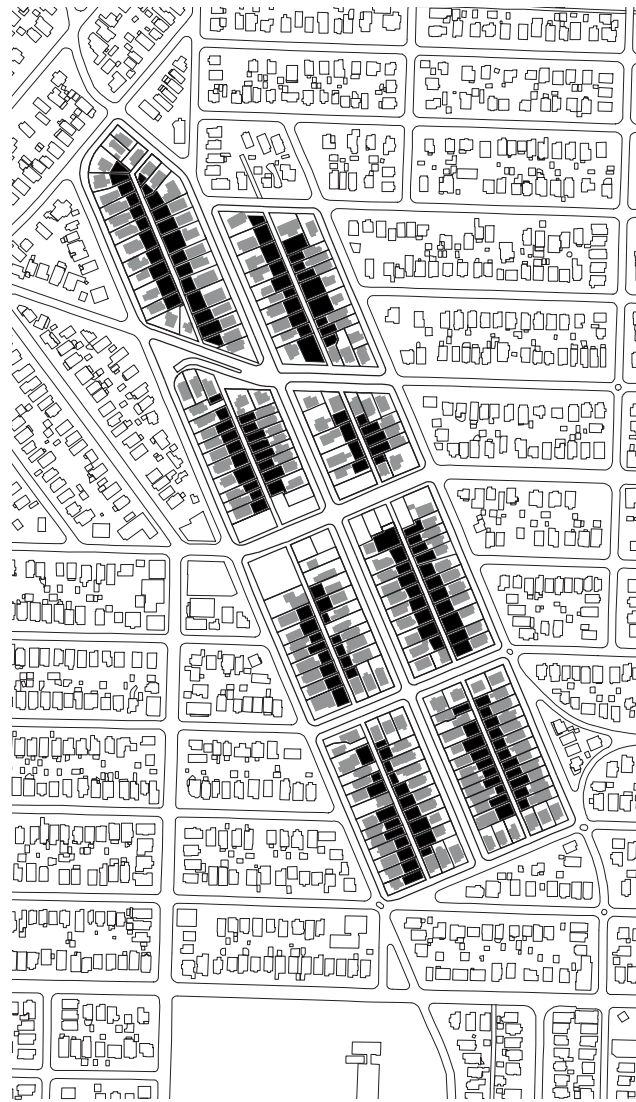
Studying the sites in more detail, it was important to choose a neighborhood where rail lines were anticipated, but which were not completely encompassed by overlay districts that allowed for substantial development outside of single-family zones. Furthermore, areas with alleys were sought out to create a product that had additional benefits in the form of urban renewal.

The mapping exercise showed that the three-quarter mile radius around the Roosevelt light rail line had the greatest potential for alley redevelopment and accessory dwelling units. See maps on previous page.

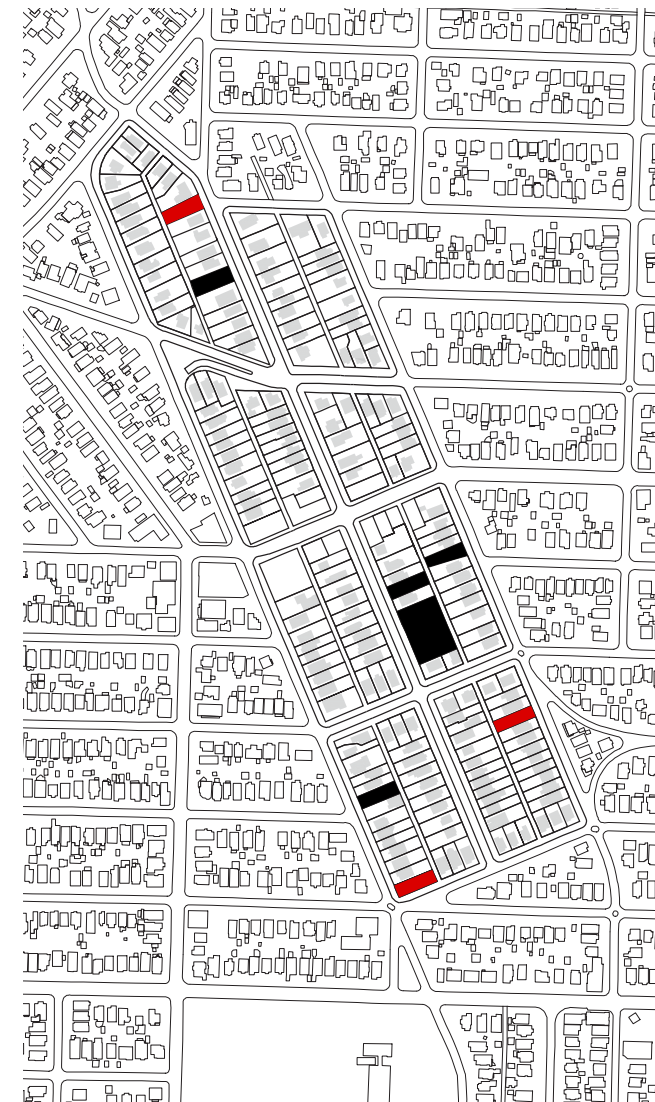
A series of eight alleyways within the three-quarter to one-mile radius of the new Roosevelt Link Light Rail station have been selected for this project. This area was chosen due to its prevalence of existing accessory dwelling units as well as north-south orientation (77 percent of all alleyways in Seattle have this orientation) and for its designation as an SF5000 zone (the most prevalent in Seattle). Overall, it reflected many of the characteristics of a standard single-family zone and served as a case study that could be replicated in other neighborhoods.



Existing Homes



Land Available for ADUs



Black: Existing ADUs  
Red: Proposed ADUs







## VI. Entitlements

Prior to beginning the design and permitting process, homeowners must first file a pre-application to confirm their compliance with the ADU regulations. The owner must have a 50 percent or greater interest in the property, must use the property as their permanent residence and live on the site at least 6 months out of the year. If they plan to outfit the unit with fixtures for a rental unit (kitchen, bathroom, etc.), they must also file an owner-occupancy covenant with King County. The regulation aims to keep homeowners in residence, thereby avoiding the negative effects of absentee landlords and encouraging a more active interest in tenants and unit upkeep.

The owner-occupancy covenants required when establishing an ADU run with the property's title. If the new owner intends to continue maintaining the accessory dwelling unit, regardless of whether they have tenants or not, they must agree to the owner-occupancy requirements. Otherwise, they must remove any features that allow it to function as a separate unit.

To convert or build a new DADU, the permit and construction process will be beyond the expertise of the average homeowner. It is likely that a contractor and/or architect will need to be hired, and permits will need to be acquired.

A Master Use permit and a Construction and Development permit will both need to be filed with the Seattle DPD. Included with these applications are a site plan showing all major features: buildings, fences, parking, etc., as well as floor plans and energy calculations. If the property is not in a designated Urban Village or Urban Center (designations by the City of Seattle for areas where dense, walkable communities are being established), an additional parking space is required for the ADU. For projects in environmentally critical areas (ECA) a pre-application site visit is also required. All other zoning regulations are similar to those required by single-family residences including: residential, building, mechanical, electrical, and energy codes regulations. 75 percent of permit fees due on submission (prior to approval).

## VII. Building Design

When considering the design of any small-scale house, efficient design is crucial. In the Pacific Northwest, the design of smaller units is often compared to designing the interior of a boat; spaces must be functional, durable and multi-use. Attached ADUs can be no larger than 1,000 gross square feet (exterior dimensions) and detached ADUs can be no larger than 800 square feet. Depending on the lot size, this number can decrease further, due to height restrictions and a 40 percent rear yard coverage requirement. Furthermore, to keep the project financially feasible, it is important to keep the design relatively simple (generally the more corners, the more cost) and to select durable materials to keep maintenance costs low. Lifecycle costing will help to determine if the initial investment will be beneficial in the long-term.

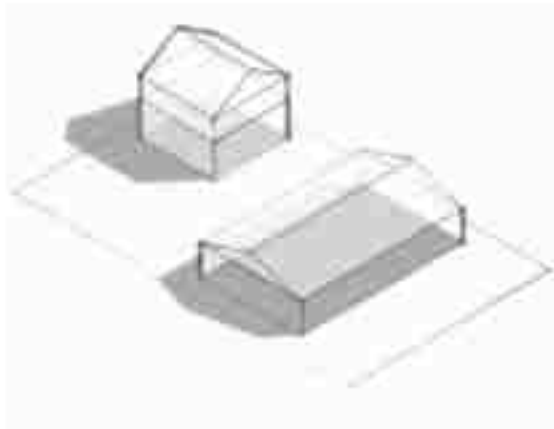
Without a particular client or site with which to respond, plan, programming and massing options are endless. The diagrams on the following page highlight some of the main site restrictions.

This design proposal sought to create three unit designs for different proposed clients in order to understand and address a variety of design problems. As a basis, in terms of programming, each design began with the same standard components. Each home was designed as a full one bedroom, one bathroom unit. This reflected the demand in the neighborhood, as well as helped to maximize the allowable square footage for feasibility purposes. Each unit also included the following amenities: outdoor space, a defined entry space, laundry facilities, a full bath, south facing roof space, and off-street parking. The parking stall is required by code, but did not have to be enclosed as a full garage. (Vancouver research showed that open air spaces were more often used for parking than enclosed garages; the latter of which were often converted into more living space.)

For all the designs, it was also essential that the new building provided a contextual response to neighborhood. It was especially important to take cues from the existing home on the lot so that the two did not appear in conflict with one another.

Privacy and security are two of the major concerns for tenants in ADU housing. Both of these concerns were addressed with the size and placement of the fenestration openings. Entry doors were all designed to front onto the alleyway, in an “eyes on the alley” approach vis-à-vis Jane Jacobs. Window fenestrations along the alleyway were also designed to provide visual access, but were placed high enough that privacy could be maintained.

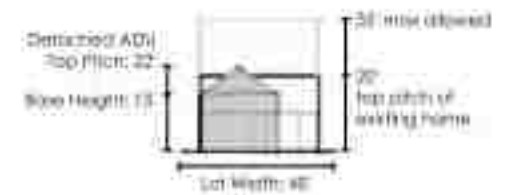
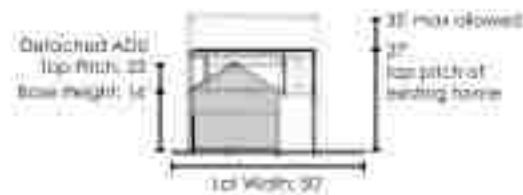
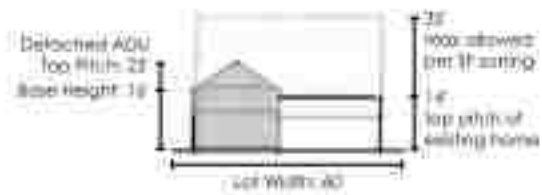
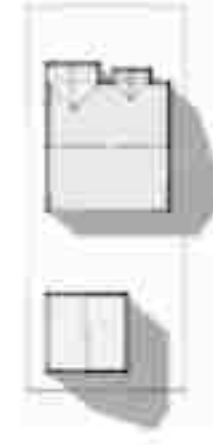
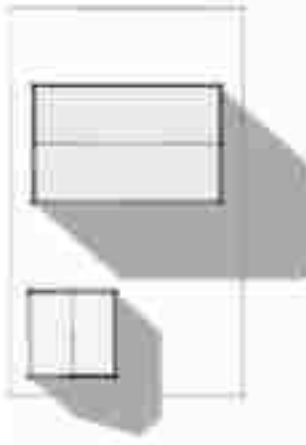
60x100 Lot



50x100 Lot



40x100 Lot

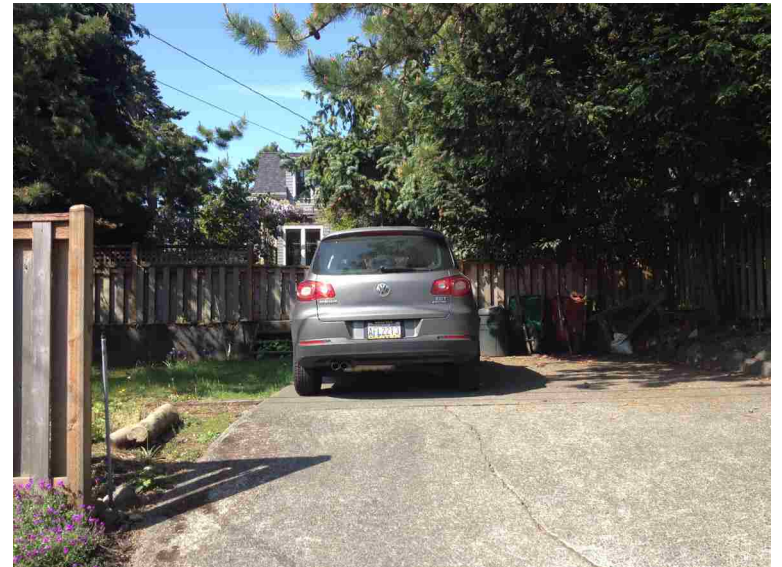


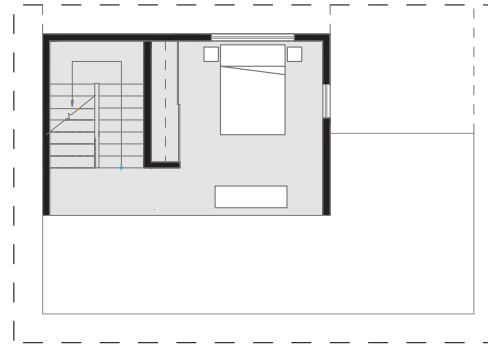
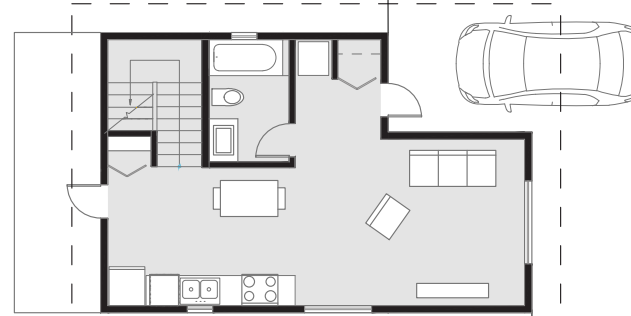
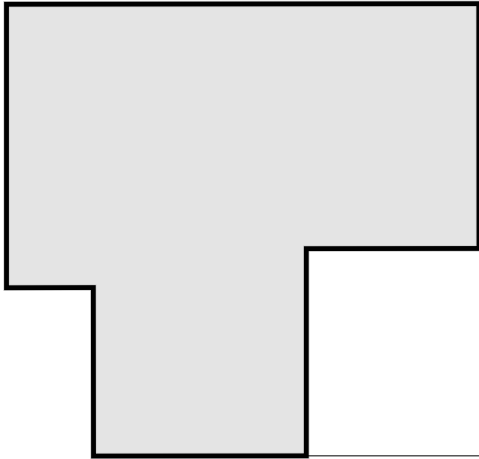
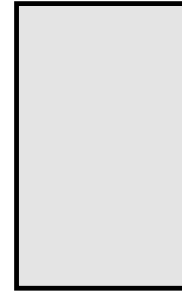
The first case study home, located at 5102 Keystone Place North, was envisioned as a unit for homeowners looking to downsize. This meant that storage and space-enhancing techniques would be especially important. The site is on a corner lot, which offered a unique condition to study. The design required one response to the main thoroughfare, and another to the alley. Due to the corner lot condition, side setbacks were increased on this site, with the standard five feet required on the shared lot line and ten feet required from the public right of way. With the existing elevations along this street frontage in mind, a larger scale improvement was deemed appropriate for this site. The home was designed as a loft, with the private sleeping spaces one-story above the open floor living spaces below.

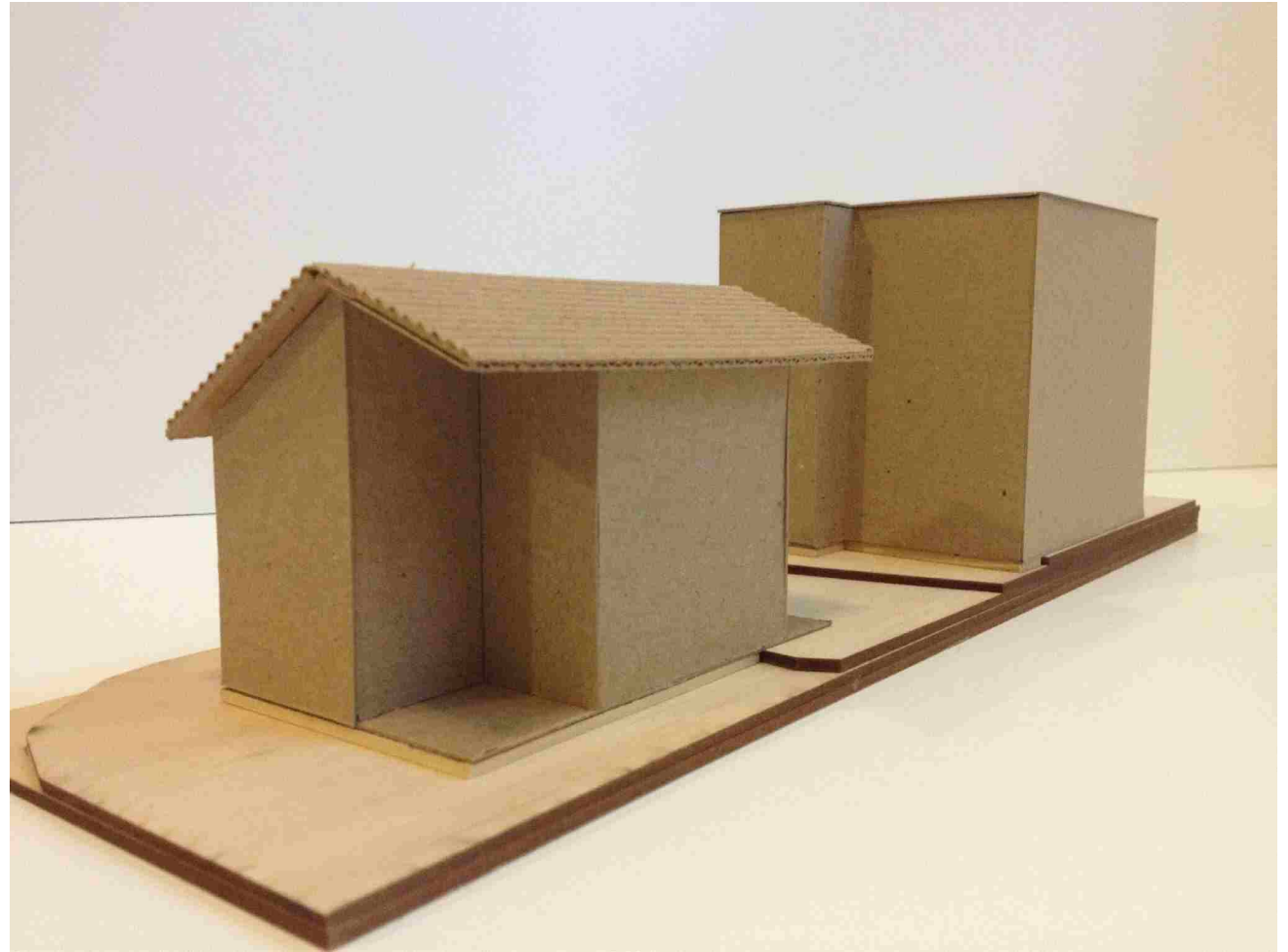


5201 Keystone Place North  
2 Bedroom / 1 Bathroom  
1030 SqFt  
\$483,000 Value

Lot: 38.5 x 125'  
ADU: 19.5' x 30'  
GSF: 767 SqFt







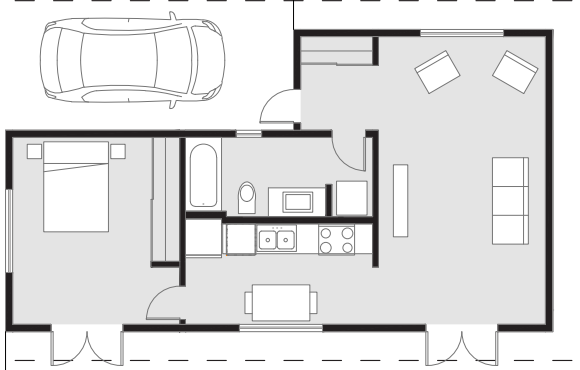


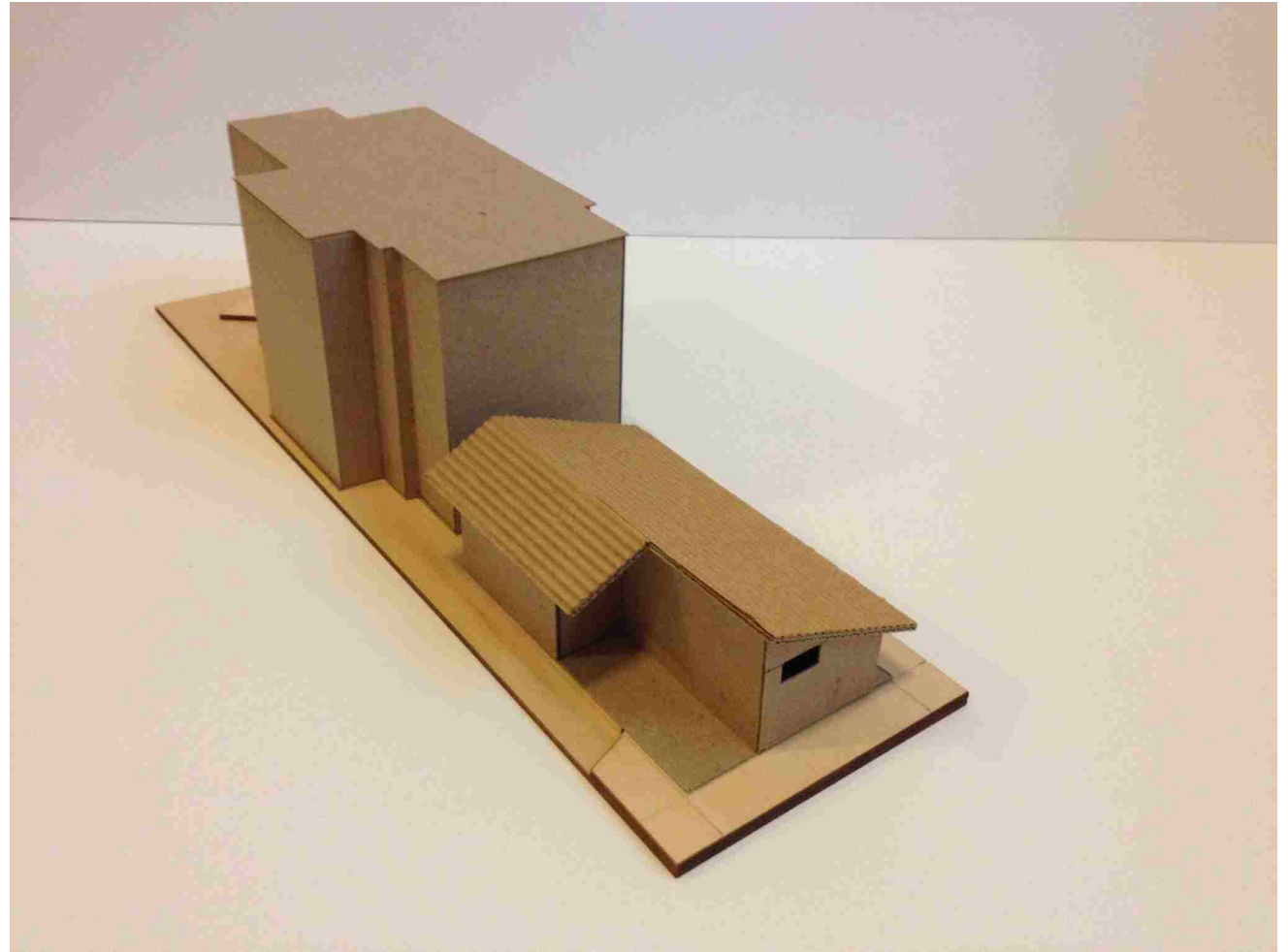
The second site, located at 5237 Kensington Place North, was envisioned as a true “granny flat,” designed as elderly housing. The floor plan took on a more traditional design, with the living room, kitchen and sleeping spaces all clearly separated. This home also achieved the most efficient design in terms of plumbing, with a utilitarian core placed at the center of the home.



5237 Kensington Place North  
3 Bedroom / 2 Bathroom  
1390 SqFt  
\$613,000 VALUE

Lot: 35' x 125'  
ADU: 21' x 38'  
GSF: 658 SqFt



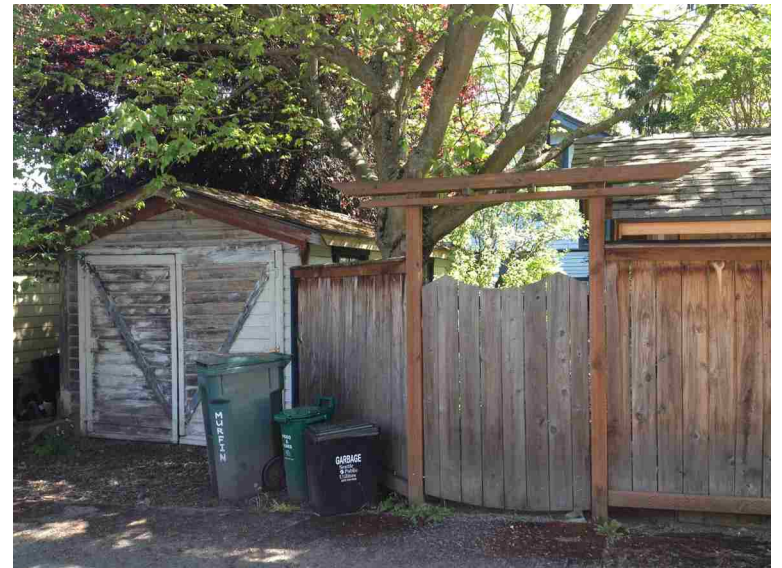


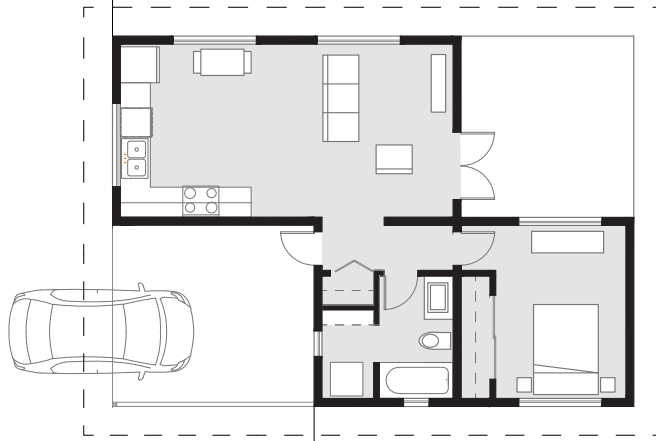
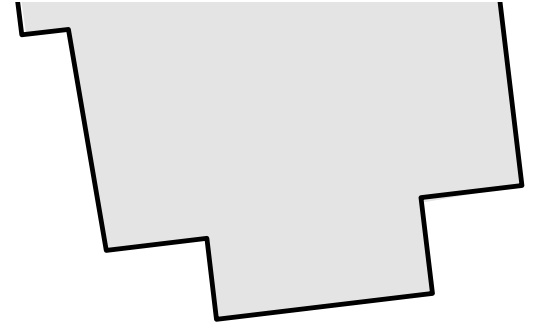
The final site is located at 5753 Kirkwood Place North, and was designed for one the most prevalent renters in the market, a young couple. In this unit it was important to provide an open floor plan for entertaining, but to also include several smaller spaces to help differentiate the spaces. A small laundry room exists off of the bathroom, as well as covered porch off the living room. This unit was chosen for the construction and financial feasibility studies, and more specifics of this home are discussed further in subsequent chapters.



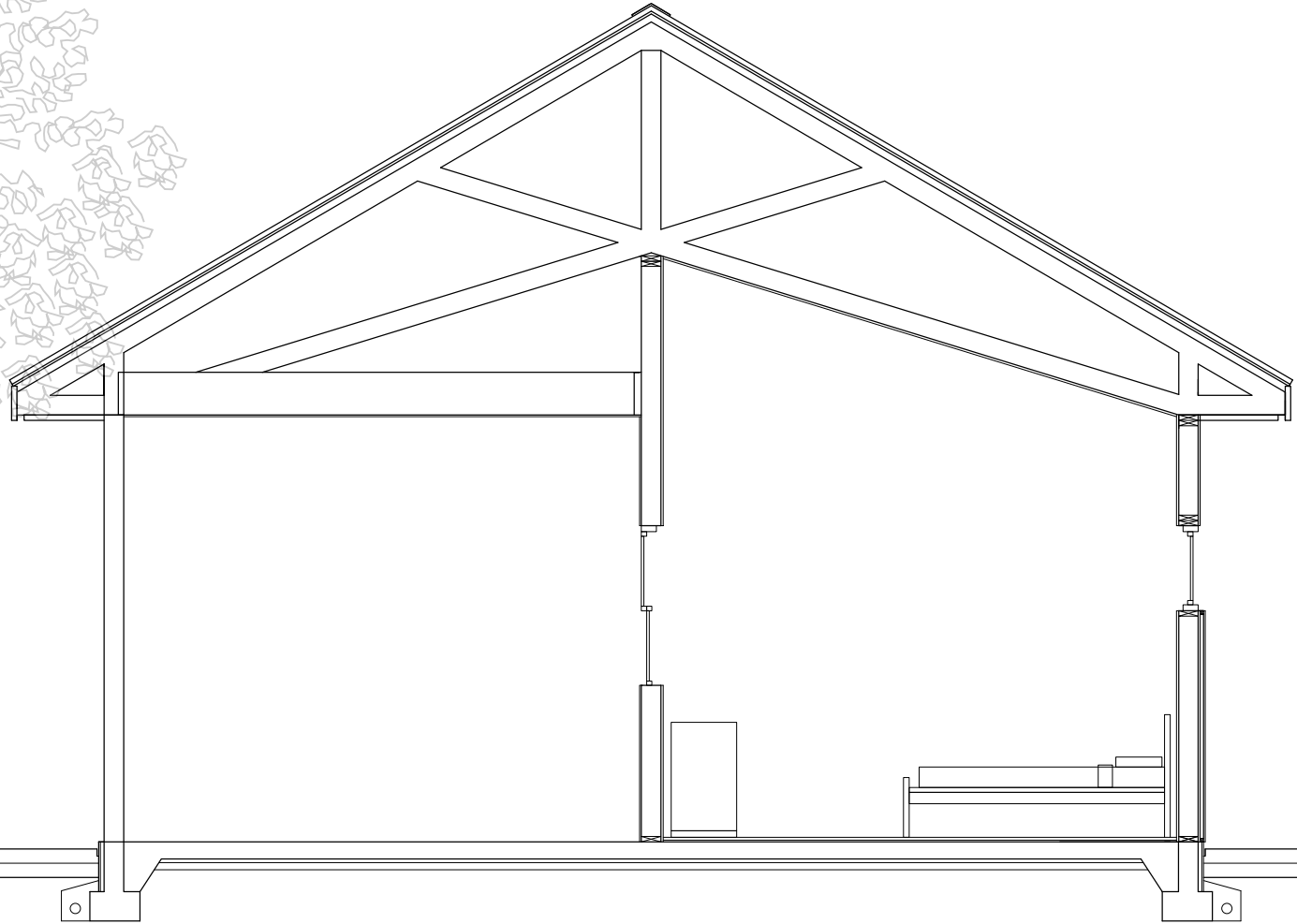
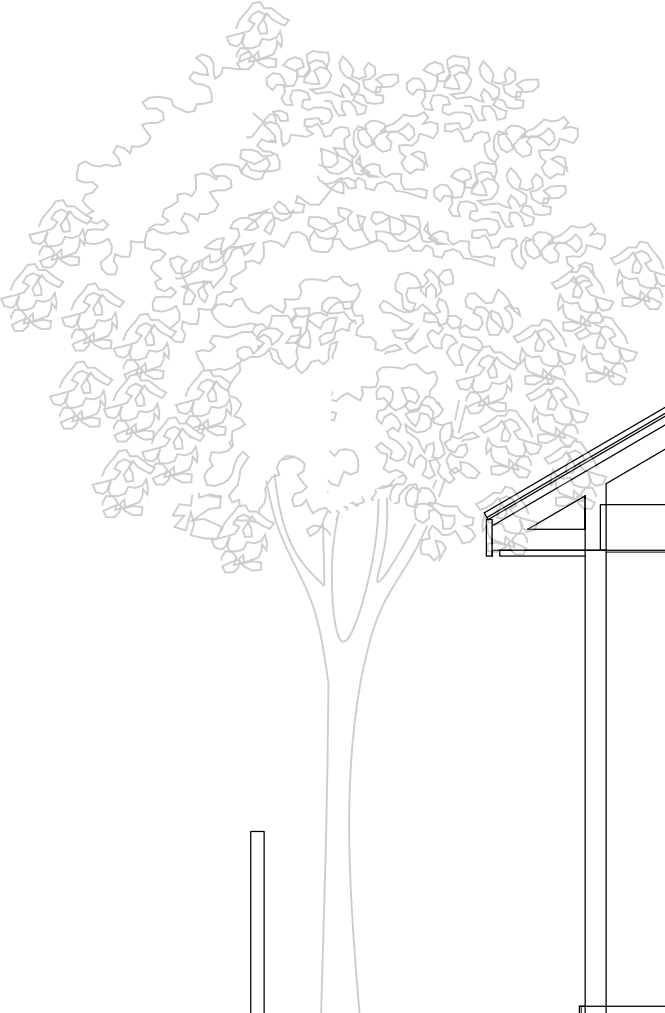
5753 Kirkwood Place North  
3 Bedroom / 2 Bathroom  
1480 SqFt  
\$531,000 Value

Lot: 40' x 125'  
ADU: 25.5' x 36'  
GSF: 604 SqFt













## VIII. Alley Design

*“Some of the most felicitous spaces, furthermore, are leftovers, niches, odds and ends of that space...” – The Social Life of Small Urban Spaces*

Infill developments have the capacity to improve the fabric of neighborhoods by cultivating the interstitial spaces of cities. Street improvements and building orientation are two key elements that can be used to create active, publically-engaged urban spaces.

### **Alleyways**

Alleyways were originally intended to hide industrial era services and servicers: waste removal, utilities, housing for the poor, and the like. Alleys provided alternate access at the rear of the home that allowed the main thoroughfares to remain unobstructed. While the need for alleys dissipated after World War II, remnants of this close-knit grid system still exist in cities and suburbs across America. In Seattle, approximately 30 percent of single-family homes have alley access.









Revitalization of this alleyway network could create a new network for pedestrians. For example, Portland is often touted as having one of the most walkable downtowns in America, one of the main reasons being the decreased size of its city blocks. At 200x200, city blocks are broken up more frequently by cross streets, offering a sense of rapid mobility and greater street engagement. In the same fashion, revitalized alleyways could increase walkability in single-family neighborhoods and provide an added street frontage for accessory dwelling units.

How then do we go about retrofitting alleyways from places dominated by trash and automobiles to places that attract pedestrians? How do we make a space become a place? Jan Gehl of Gehl Architects suggested, “Do not look at how many people are walking the city, but look at how many people have stopped walking to stay and enjoy what is there.”

One idea is to remove or limit the services currently provided in alleyways. The City of Seattle has adopted the Clear Alleys Program which limits the time dumpsters can be in an alley. Pickups are more frequent and allow for greater flexibility of uses in the alleyways during all other times. This has been especially popular in the downtown and Pioneer Square neighborhoods, where alleys have been transformed into event spaces that serve the downtown population after hours. In a similar vein, the City of Melbourne has changed the size of its waste fleet vehicles in order to allow for a greater variety of uses in its alleyways.

Smaller, more incremental changes have been tested as well, such as lighting and signage. The mere act of providing a name to an alley has been shown to create a sense of place and increased ownership (consider Post Alley in Seattle).

Landscaping is also an integral part of creating an intimate scale within an alleyway. This aspect also positively affects the ecological health of the city, allowing animal habitats to be reestablished and water collection and treatment to happen on site, reducing the loads on city systems.

However, the strategy that seems to have one of the largest impacts on alley character is the quality of paving. In Vancouver, a pilot program tested the effects of pavement replacement in alleyways. After gaining approval from at least three-quarters of neighbors, the city would provide 50 percent of the funding needed to complete repaving improvements. Its most successful project was on Country Lane (pictured on following page), garnering neighborhood support and providing a place of refuge for the community. Unfortunately, despite the qualitative successes of the project, the city is no longer able to provide matching funds and laneway revitalization projects now require 100 percent equity and 100 percent neighbor approval.

### **Site Orientation**

Beyond improvements to the alleyways, the orientation and frontages of buildings plays a major role in the experience of neighborhoods. In the 1960s, Jane Jacobs drew the world's attention to the benefits of having "eyes on the street," the core tenets of which are still applicable. As seen in the Vancouver examples, laneway houses are most successful when oriented toward the alleyway, engaging with an area otherwise ignored by pedestrians. Of special importance are corner lots, which would theoretically engage with the street on two sides. Due to the orientation of these corner dwelling units, they have the ability to create more social engagement and provide a more aesthetically pleasing street frontage.



Country Lane, Vancouver, BC  
Photo Credit: Ben Nelm, National Post







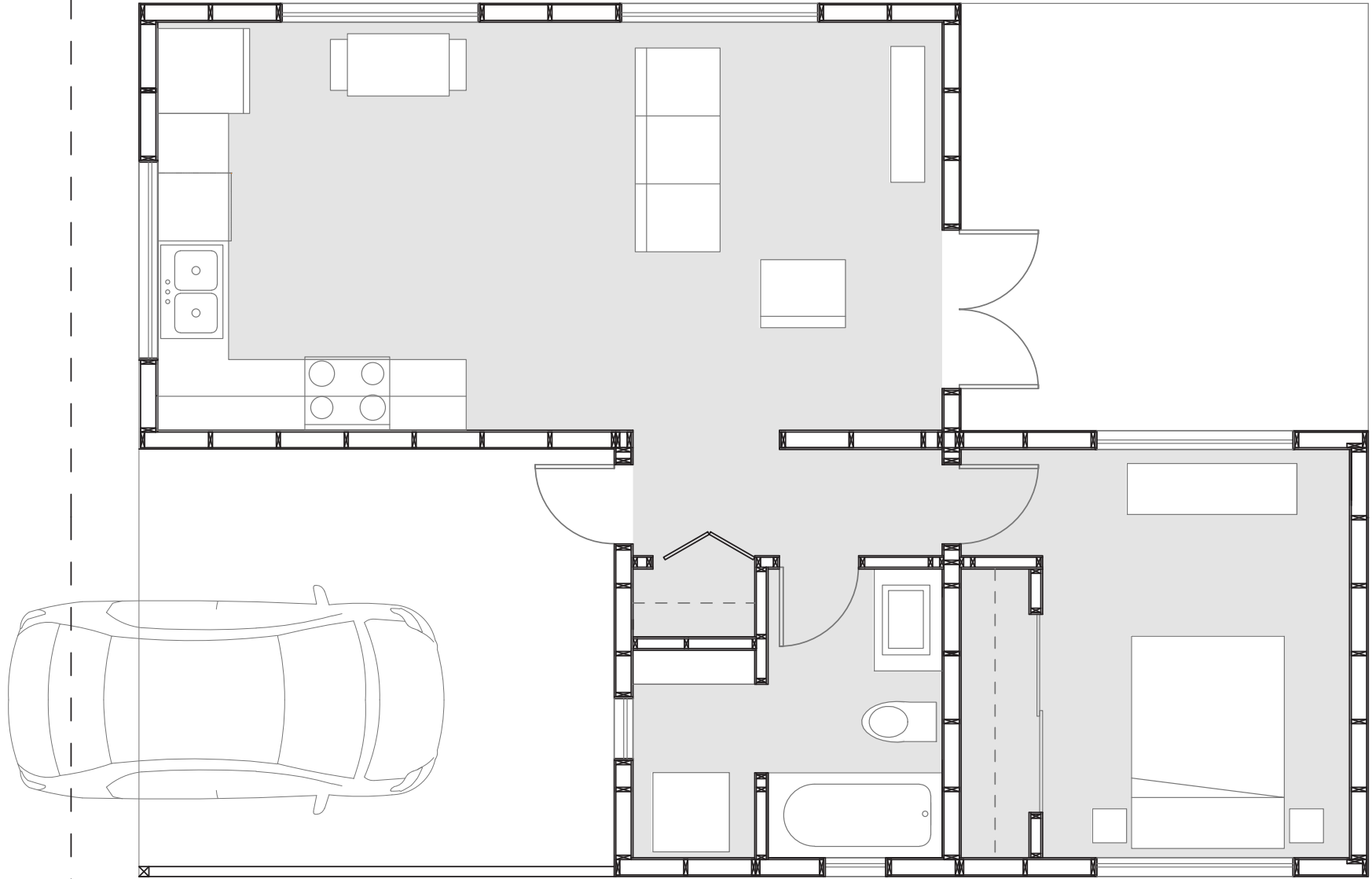


## IX. Construction

The materials and methods utilized during construction have a major impact on the financial feasibility of a project, in addition to its environmental impact. Sustainable construction practices are gaining popularity due to state and national programs that help builders measure and evaluate their projects. The core tenets of these practices include considerations for durability, minimized material use, appropriate engineering and sizing, local materials, efficient production, and environmentally friendly finishes. Each of these tenets contributes to the health and well-being of tenants, workers and the environment.

The first major decision in a project of this size involves the selection of a framing system. In the Pacific Northwest, the prevalence of lumber has allowed stick framing to remain the most cost-efficient structural system. Single-family residents, as well as the popular five-over-one multi-family housing structures, employ stick construction methods. Additionally, this project implemented advanced framing methods (as seen in the framing plan). Advanced framing involves much more diligence on the part of the structural engineer, in order to correctly size the members. For example, in traditional framing, large headers (i.e.: 4x12s) were used over door and window openings. The size and thickness of these members were out of proportion to the loads being transferred and could be sized down. This meant lower costs, as well as less depletion of old growth forests (often required to procure large members). Engineered trusses also help reduce the use of large structural members. Advanced framing has also affected the traditional wall layout; rather than spacing studs at 16-inch on-center, advanced framing uses 24-inch on-center spacing, again reducing the amount of lumber needed. 24-inch spacing also permits less heat transfer through the building, and with greater spacing in the wall cavity, there is more room for insulation. The use of California Corners also contributes to a more efficient envelope; by employing two studs it saves material (typical corners use three members) and their orientation allows full insulation at the corners.





Beyond the framing methods, green building practices were employed in all major components of the project. Despite increased up-front costs, durable materials (standing seam metal roof panels, rain screen system, tile floors in wet areas) were selected to decrease maintenance costs over the life of the building. The roof design contributes to this concept, with 24-inch overhangs that protect the siding system from the elements. Each roof was also designed with an east-west roofline, providing south facing slopes for easy solar upgrades. On the interior, bamboo-laminate flooring, high-efficiency mechanical and plumbing fixtures, and low-flow water valves were specified. On the exterior, porous paving was used along the alleyway to decrease wastewater runoff, and the slab-on-grade foundation was wrapped with 1-inch perimeter insulation to reduce the effects of thermal bridging.

Construction costs can vary greatly depending on the level of complexity, size and quality of materials. This project was designed with simplicity of massing, and durable, no frills materials. A cost breakdown by CSI code is shown in the axonometric diagram to the left. After including materials, labor, taxes and contingency, cost per square foot is just below \$200.

32

EXTERIOR IMPROVEMENTS  
LANDSCAPING: \$1,100

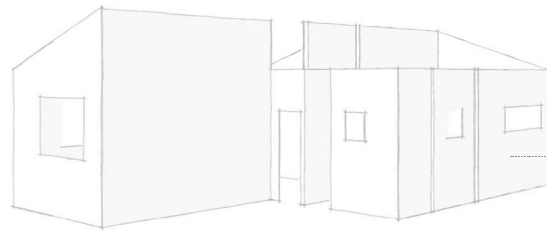
22, 23, 24

PLUMBING, HVAC, ELECTRICAL  
PLUMBING: \$8,300  
HVAC: \$5,200  
ELECTRICAL: \$8,900



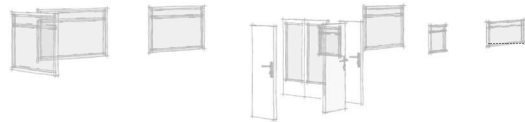
12

FURNISHINGS  
CABINETS: \$4,700



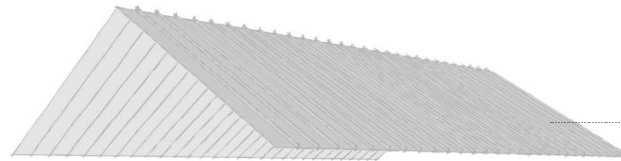
09

FINISHES  
DRYWALL/TRIM: \$8,075  
FLOORING: \$7,000  
COUNTERTOPS: \$1,650  
PAINT: \$5,300



08

OPENINGS  
DOORS/WINDOWS: \$5,000



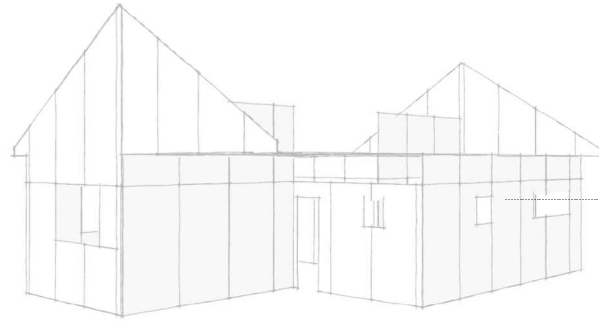
07

THERMAL AND MOISTURE PROTECTION  
ROOF GUTTERS: \$12,000



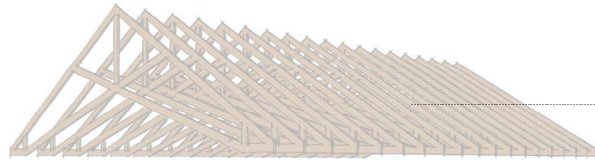
07

THERMAL AND MOISTURE PROTECTION  
SIDING/TRIM/TYVEK: \$9,000



**06**

WOOD, PLASTICS AND COMPOSITES  
PLYWOOD: \$3,000



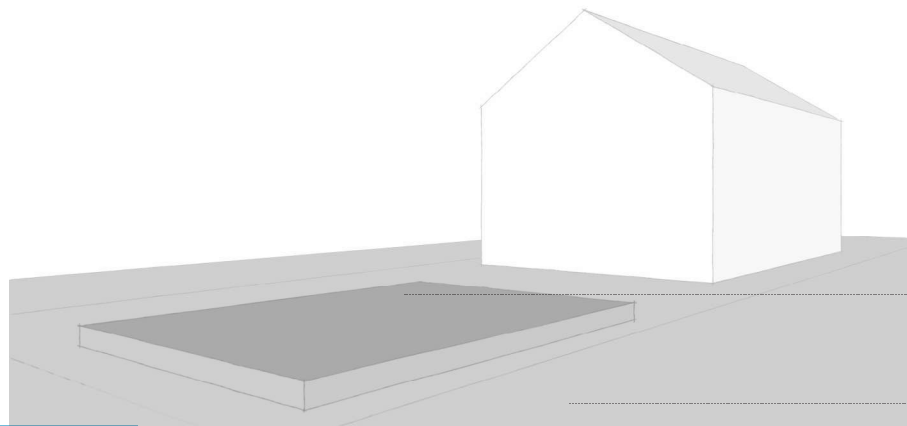
**06**

WOOD, PLASTICS AND COMPOSITES  
TRUSSES: \$6,000



**06**

WOOD, PLASTICS AND COMPOSITES  
ROUGH CARPENTRY: \$3,000



**03**

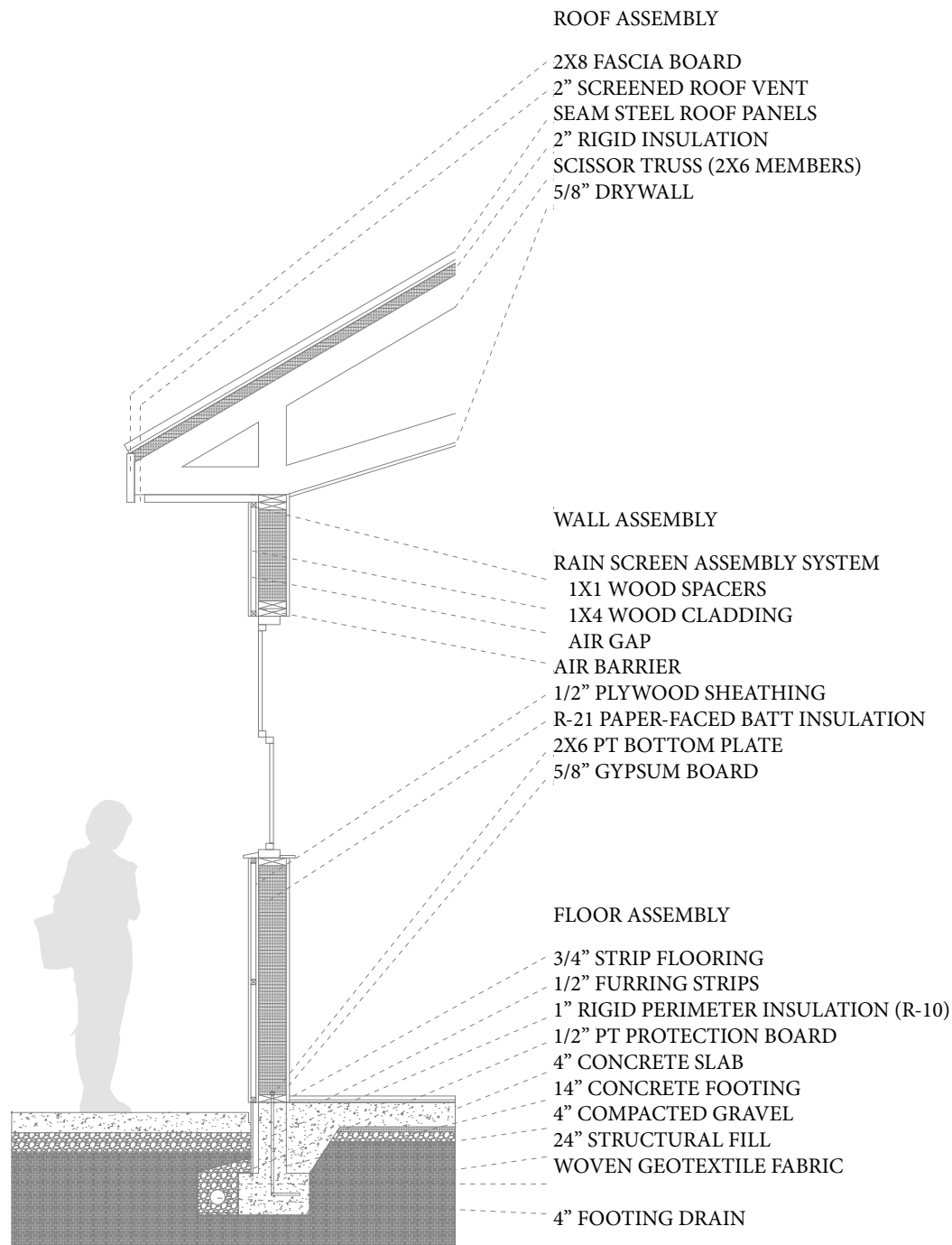
CONCRETE  
FOOTINGS/SLAB: \$8,500

**02**

EXISTING CONDITIONS  
DEMO, SITE PREP: \$15,500

**01**

GENERAL REQUIREMENTS  
ADMIN, TEMP FACILITIES, EQUIPT: \$6,800





## **X. Development Potential**

In an ideal situation, design, construction and development professionals would undertake the development of ADUs. Factoring in time and the difficulty of achieving community approvals for large development projects, investing in individual ADUs could provide a fast and flexible development option. However, regulatory guidelines have prevented this from occurring.

### **Regulatory Hurdles**

The most onerous aspect of the ADU regulation is the requirement to sign an owner-occupancy covenant. The covenant obliges that the owner of the property own a 50 percent or greater share and live on the premises for six months or more per year as their primary residence; both of which are in place to prevent an absentee landlord situation. However, the covenant also includes resale restrictions, requiring that in the event of a sale, the ADU be converted from a livable space to a non-livable space (should the new buyer decide not to sign the covenant). Essentially this means removing the kitchen and thus significantly reducing the value of the property.

### **Determining Value**

Perhaps one of the most difficult facets of the ADU process is determining the effect on property values. The appraisal standard for single-family homes is the Sales Comparison method. However, with so few ADUs in existence, finding quality comps can be difficult and as a result, estimates of the contributing value can vary widely. Furthermore, residential appraisers struggle with how to incorporate the added value of the anticipated income stream. It is standard for commercial appraisers to use the Income Capitalization approach to obtain the appropriate market value, but appraisal guidelines have not yet been updated to allow this for residential units. Thus, the development of ADUs oftentimes require more security (equity) than a homeowner has to offer.

As discussed previously, ADUs have benefits beyond those that may be expressed in an appraisal. Increased density has tremendous environmental impacts including lower carbon emissions, increased efficiency of infrastructure, healthier occupants, etc. ADUs have also been seen to positively affect communities; the additional “hidden density” brings a more diverse population and with it a more widespread variety of amenities and small businesses.

Despite clear increases in value, studies have shown that properties with ADUs average only about 10 percent higher values from an income viewpoint. Given that the value can change from owner to owner (depending on acceptance of the owner-occupancy covenant), most appraisers only recognize the improvements of an “upgraded garage.”

### **Construction Loans**

Obtaining a loan to cover the construction costs is likely one of the greatest hurdles facing the ADU program. Securing financing is typically the responsibility of real estate developers, but they have been pushed out of this market by the owner-occupancy covenant. This means the responsibility must shift to the homeowner. As noted previously, banks are uncertain how to appraise these improvements and therefore often cannot provide the full amount of financing to residents trying to build an ADU. Instead, a homeowner must have enough disposable income available or enough equity in their property to draw upon. Using the latter as an example, in the Tangletown neighborhood, the median home prices were \$700k. In order for a homeowner to have enough equity built up to cover the costs of a \$150,000 ADU, they need to have paid down their mortgage for approximately 15 years. Such a high barrier to entry is keeping many young homeowners (who could likely benefit the most from an additional income stream), out of the ADU market.

### **Professional Developers**

For developers to break into this market one option would be lobbying to change the owner-occupancy regulations to allow for commercial activity. By doing so, properties zoned for single-family use could become 100 percent rental, operated by an outside landlord. This type of regulation is allowed in Portland and Vancouver and has been quite successful. (In Portland, approximately 33 percent of all ADU units are operated in this manner.) However, it is also feasible that investors could assist homeowners with development and construction oversight with a modest fee.

Even if developers were allowed to break into this market, a huge hurdle to this type of small-scale development is locating enough sites to make the time and capital investments worthwhile. A conglomeration of sites will be needed each year to execute this plan and create economies of scale. This would likely only be feasible if the improvements to the main house were completed concurrently and then sold. Essentially, developers would need to identify dated housing stock listed at a discount, acquire, improve and return it to the market. In order for this scheme to be successful, this must occur in an area with latent demand and a capacity for higher sales prices and rents. Specifically, markets with significant potential for value add must exhibit the following market fundamentals: significant sale spread between dated product and newer products (price per square foot basis), high vacancy rates, high rental rates (value for ADU), high-income residents and market desirability. Another option would involve lot subdivision, in which a homeowner could sell a portion of his property to a developer. However, this option is currently not permitted on single-family lots.

## **XI. Financial Feasibility**

Assuming no change in current regulatory or lending procedures, this thesis tested the feasibility of ADU development assuming a homeowner had sufficient equity to finance the construction. The full cost pro forma is shown below, beginning with the hard costs discussed previously (approximately \$200 per square foot). In addition, there are fees required for design/engineering, permits and inspections, leasing (AirBNB, etc.), loan fees and soft cost contingency. In total, soft costs equal more than 15 percent of the total project costs. While Seattle has yet to offer any incentives, Portland recognized the benefit of ADU housing and began waiving permit and inspection fees (on average an \$8,000-11,000 savings for its homeowners) to incentivize development. In its first year, Portland saw applications increase six fold and has extended their incentive program through 2016.

After estimating the total development cost, a home equity loan was assumed to secure the funding. Interest rates for these loans are relatively low right now, with a 3.125 percent interest rate for a fifteen-year term (plus a 2 percent loan origination fee which was included in the cost pro forma). Over the course of the loan, this equals a monthly payment of just over \$1,050.

Shifting to the income pro forma, the aim is to evaluate the local rental market and costs associated with renting the unit. Prior to studying specific rates, it is important to study the market fundamentals in Seattle and the specific submarket. This helps to determine whether there is adequate demand, based on demographics, vacancy rates and the development pipeline.

## **Demographics**

While many have labeled ADUs as “granny flats,” there is increasing evidence that these units are also attracting the massive Gen Y population. An estimated 80 million people make up Generation Y and their inclinations are toward smaller housing units in dense urban areas. Baby Boomers are also downsizing and looking for more affordable, urban options. Accounting for 25 and 35 percent of the population respectively, developing housing to align with the needs of these two major demographic groups has the potential to become an extremely lucrative business.

42.4 percent of King County residents currently live in rental housing and the trend is expected to grow in the coming years. Net in-migration is trending toward younger residents with tenancies toward rental housing. It has been estimated that 80 percent of recent movers to the Seattle MSA are renters; this is a highly educated group that wants the flexibility of renting but has the income for higher-rent spaces.

## **Vacancy Rates**

Apartment vacancy rates have remained in a remarkably low range. In the past decade, rates have spanned from 3.32 percent (Q1 2013) to 7.09 percent (Q3 2004). On average, King County maintains a stable average of 4.98 percent. This is below the national average and exhibits a tight housing market with room to expand.

The Greenlake/Wallingford submarket is currently sustaining the second lowest vacancy rates in Seattle at 1.7 percent (behind Beacon Hill's 0.5 percent). For newer, stabilized product (post-2009) Greenlake/Wallingford holds a 1.6 percent vacancy rate. Currently 1,835 residential units are actively pursuing permits in North Seattle (Ballard, Greenlake/Wallingford, North Seattle, Shoreline, University District).



## **Development Pipeline**

As the economy has recovered from the 2008 recession, debt and equity markets have rebounded and developers are again seeing good access to capital and very favorable interest rates. This has expedited development in the region and is expected to continue for several years. More than 21,000 units are expected to come online in 2014 and 2015, a record number for King County. Despite this substantial amount of supply, 41.6 percent of the new product is slated for the Central Seattle submarkets (CBD, Belltown, South Lake Union, Capitol Hill, Eastlake, Central District, First Hill, Madison Park, Magnolia and Queen Anne) with more than half of the supply going to the CBD, South Lake Union and Belltown. While market analysts believe that these markets are going to become overbuilt, there seems to be potential for value-add and opportunistic development in other submarkets.

The Greenlake/Wallingford submarket gained 513 new apartment units in 2012 and 2013, with an additional 2,154 anticipated by the end of 2015. Despite high levels of supply, vacancy rates are only expected to increase to 4.4 percent, highlighting strong absorption for the neighborhood.

## **Rents**

The Greenlake/Wallingford submarket includes 3,709 units of housing stock (16.6 percent of “North Seattle” stock). Rental rates are second highest in the North Seattle area, averaging \$2.03 per square foot across all unit types, newer products averaging \$2.42 per square foot (2013). In order to determine what rents ADUs would command, new multi-family project rental rates were blended with rents shown for older housing stock. Escalated at 3 percent annually, monthly rent was determined to be \$2.50 per square foot. For a 650 square foot ADU, this equals \$1625 per month gross. Subtracting out allowances for vacancy and credit loss, as well as operating expenses specific to the unit, the overall monthly income came to \$1341. Comparing the monthly loan payment (cash out) to the income pro forma (cash in), the rental of ADUs in Tangletown is clearly financially feasible, proving that if ADUs are done properly, they have the capacity to provide a stable income stream for homeowners, as well as an increased value at sales.



DEVELOPMENT COSTS

**\$152,083**



MONTHLY LOAN PAYMENT

**\$1,059**



NET INCOME P/MONTH

**\$1,341**

## COST PRO FORMA

<b>HARD COSTS</b>			
ADU CONSTRUCTION	\$181.35	P/SQFT	\$117,878
WSST	9.50%		\$11,198
<b>TOTAL HARD COSTS</b>	<b>\$198.58</b>	<b>P/SQFT</b>	<b>\$129,076</b>
<b>SOFT COSTS</b>			
A/E	7%	OF TOTAL CONSTR	\$9,035
SPECIAL INSPECTIONS	2.5%	OF TOTAL CONSTR	\$3,227
PERMITS	2.5%	OF TOTAL CONSTR	\$3,227
LEASING FEES	0.5%	OF TOTAL CONSTR	\$645
LOAN FEE	2.0%	OF TOTAL LOAN	\$3,000
CONTINGENCY	3%	OF TOTAL SOFT COSTS	\$3,872
<b>TOTAL SOFT COSTS</b>			<b>\$23,007</b>
<b>TOTAL COSTS</b>			<b>\$152,083</b>

## LOAN PAYMENT

<b>FINANCE (HOME EQUITY LOAN)</b>	
LOAN AMOUNT	\$152,083
INTEREST RATE	3.125%
TERM (YEARS)	15
<b>PAYMENT (MONTHLY)</b>	<b>\$1,059</b>

## INCOME PRO FORMA

<b>GROSS RENT</b>			
DADU - 1 BEDROOM/1 BATH	650	SQFT	650
DADU RENT	\$2.50	P/SQFT	<b>\$1,625</b>
<b>LESS VACANCY / CREDIT LOSS</b>			
DADU	3%	P/MONTH	<b>(\$49)</b>
<b>LESS OPERATING EXPENSES</b>			
UTILITIES (SEWER / TRASH)	\$25.00	P/MONTH	(\$25)
MAINTENANCE	\$50.00	P/MONTH	(\$50)
INSURANCE (LIABILITY)	\$30.00	P/MONTH	(\$30)
TAXES	\$130.41	P/MONTH	(\$130)
<b>TOTAL OE</b>			<b>(\$235)</b>
<b>NET OPERATING INCOME</b>			<b>\$1,341</b>

OVERAGE (P/MONTH)	\$281
OVERAGE (P/YEAR)	\$3,377

## XII. Conclusion

In response to climate change, vast expectations for growth, and changing demographics, much of the Cascadia region has now begun to adopt ADU regulations. ADUs address the growing need for affordable rental units, the desire for increased density, and both the limitations and opportunities a space market heavily stocked with single-family homes. They allow cities to increase density, keep residents from sprawling, and reduce carbon emissions. Furthermore, especially in times of economic hardship, they address the growing demand for a range of housing options. ADUs have the flexibility necessary to accommodate this demand, whether it be to provide housing for a family member, allowing homeowners the option to downsize or providing an additional income source. ADUs serve as an attractive and affordable housing option for renters as well, allowing them the opportunity to enjoy the advantages of a single-family home without the burden of homeownership.

ADUs are also a financially feasible investment for homeowners, as they cost less to build and finance than is received in monthly rental cash flow. They offer a cost-free means to invest in the community, benefiting homeowners, renters and the environment.

Despite the clear benefits of ADU development, most individual families do not have the means to build or oversee a project of this magnitude. Regulations are complex and harrowing for most single-family property owners, and financing is difficult to obtain. Despite the apparent opportunity, the residual land value of these properties is not being capitalized upon. To encourage ADU development, cities need to either offer incentives to homeowners, or otherwise remove the owner-occupancy restrictions in order to utilize the intellectual capital possessed by entrepreneurial developers. Either way, ADUs must become a more prominent tool for absorbing growth in our cities.

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