

2012

Redesigning Suburbia: Establishing a New Infill Development Model for Existing Suburban Communities

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**REDESIGNING SUBURBIA:
ESTABLISHING A NEW INFILL DEVELOPMENT MODEL FOR EXISTING
SUBURBAN COMMUNITIES**

A Thesis Presented

By

RICHARD A HOLT

Submitted to the Graduate School of the
University of Massachusetts Amherst in partial fulfillment
of the requirements for the degree of

MASTER OF ARCHITECTURE

May 2012

Architecture + Design Program
Department of Art, Architecture and Art History

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ABSTRACT

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MAY 2012

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The suburb's contribution to natural resource depletion, reliance on the automobile, and disregard for social connections has been well documented in the last 10-20 years.

While these depictions are often accurate, many suburbs have successfully addressed these issues by providing walkable streets and accessible communal corridors.

Innovative precedents such as Village Homes, in Davis, CA, Eichler Homes, in CA, and Skinny Homes, in Portland, OR, and others, provide examples of successful suburban developments that incorporate renewable energy solutions, passive design features, and limit the development of native landscapes.

This thesis aims to design a framework to be used in the redevelopment of existing suburban communities. Using an existing low-density suburban community in Simi Valley, CA, as a site, I have explored compact infill housing as a method of densifying the neighborhood and broadening the housing base. Prefabrication and deconstructable building components ensure minimal waste and a flexible housing system that can adapt to mimic the evolution of a family. Accessible open space serves to draw the community together and provide usable outdoor spaces. In this way the suburban community can begin to operate in a more efficient manner and adequately address the needs of a broader range of residents.

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CHAPTER 1

HISTORY OF SUBURBIA

1.1 Introduction

“Most of America’s urban growth since World War II...has taken place in the suburban-rural fringes of major metropolitan areas rather than in the central cities or older post-World War I suburbs.”¹ The rise and appeal of suburban living has led to significantly less preserved open-space in the United States as well as an increased reliance on the automobile. Often, sprawl is described as relating to disaggregation, poor air quality, and unsustainable living trends. Suburban sprawl, as a growth model, produces various obstacles for healthy community development, but also presents significant benefits for residential living. In fact, considerable efficiencies exist in the development of suburban communities, and thus a middle ground between suburban sprawl and densification must be struck.

1.2 World

Suburbs have been around for a long time and one of the first examples occurred just outside the ancient city of Rome. During this period living outside of the city wall was considered living in *suburbium*, meaning that which was “literally below or outside the walls.” Life inside of the town wall was significantly denser, and was generally more convenient. Living in a suburb outside of the city was often “a matter of cost”, as the people inhabiting the suburbs were forced “to forgo urban services and the protection of the walls.”² This example of *suburbium* portrays a middle class alternative to expensive life in the city. The other historical example of suburban living exemplifies an expensive alternative to the city, characterized by spread out large countryside houses often within

a few days journey from the city. Examples can be seen in large estates in the English countryside, often owned by rich merchants. These residences represent an upper-class ideal of suburbia, removed from the pains of the city and characterized by private ownership and large quantities of land. Both examples, however, represent an alternative to life in the city.

1.3 United States

The rise of suburban living in the United States of America largely began as a lower-class alternative to life inside of the city, though examples of opulent second homes outside of the city can be found. The end of World War II, however, and the subsequent housing crisis marked the trend towards suburban living as a middle class option of residential living. The industrial revolution had created the means to mass-produce building components and house production began to resemble assembly-line automobile production. Levittown, NY, the first major post-World War II suburban development, appealed specifically to the middle class, as homes were moderately sized and the community was entirely based on the private ownership of an automobile. Residents simply could not get around without an automobile. Many media outlets portrayed suburban living as the American Dream, whereby private ownership of a single-family detached residence would signify a form of personal success and achievement. Suburban developments featured strict lot-lines, arterial corridors, and cookie-cutter style housing units that attained a level of differentiation through paint treatments and subtle shifts in window & door placements. Generally speaking, the developments featured 4-5 styles of housing with similar floor plans, with subtle variations on each.³

CHAPTER 2

PRECEDENTS

2.1 Levittown - Mass Production

Levittown, NY, began as “an experiment in low-cost, mass-produced housing and became, perhaps, the most famous suburban development in the world.” Abraham Levitt, a real estate lawyer, had invested in a real estate development called “Rockville Centre”. With the onslaught of the Great Depression came a halt in the development of Rockville Centre, as the developer was defaulting on his loan. Levitt chose to complete the project himself, in order to preserve his investment, with the help of his two sons, Alfred and William. This project proved a success and marked the beginning of a series of developments by Levitt & Sons. In 1941, Levitt & Sons began to perfect the concept of mass-production in their housing developments. William Levitt, having served in the Navy during WWII, recognized the housing need for returning soldiers who wanted to start families. A housing shortage, cheap available farmland, and a concept for mass-produced cheap housing had Levitt & Sons beginning the development of Levittown.

In May of 1947, Levitt & Sons revealed their plan for Levittown, a 2,000-unit rental housing development. To cut costs, Levitt & Sons decided to build on concrete slabs instead of basements, use precut lumber from their own lumberyard in CA, and hire non-union contractors. They had developed a “production line” methodology focused on cost savings and efficiency, and “by July of 1948, [they] were turning out thirty houses a day.” Even this could not keep up with the demand, however, and eventually the project increased significantly in scope to include 4,000 houses, schools, postal delivery services, and more.

Eventually focus shifted to building homes for purchase rather than rental, and by 1951 Levittown included 17,447 homes. These houses started as cheap, simple ranch-style homes and grew to accommodate larger and wealthier families. Over time, the cookie-cutter style reflecting the mass-produced nature of Levittown has been altered, to accommodate for changing needs. Figure 1 is an aerial view of a part of Levittown, showing the cookie-cutter plots that make up the suburb.



Figure 1 – Levittown Aerial.
From National Archives and Records Administration, 1959

This image is highly indicative of general tract home characteristics. Space is distributed according to the maximization of private residences. Houses look incredibly close together, and each has its own back yard and front yard to provide the resident(s) with ample space for privacy. Streets are the connecting arteries that link everything together; or, in many cases, they are the things that create subdivisions and act as physical barriers. Every house is designed in much the same way, with subtle

differences from neighboring units to create the illusion of variety. But in reality, Levittown, and many other suburban developments, are assembly-line productions of identical units, which are then painted different colors to suggest differentiation, when actually there is very little. Figure 2 diagrammatically shows the sameness of every house on the block.



Figure 2 – Levittown Diagram.
By author

The media played a large role in the success of the idea of the suburb. Brochures like Figures 3 and 4 show the (4) kinds of houses one can choose from in Levittown. Other newspaper articles showed snapshots of life in the suburb as a dreamy release from the stresses that one experienced in urban areas. Time magazine did articles on suburbs

and even had Abraham Levitt on its cover, following the development of Levittown. The media helped commoditize the post-WWII house and the idea that life was better in a suburb.



Figure 3 – Levittown Brochure.
 From <http://www.antiquetrader.com/article/Levittown_the_birth_of_the_burbs>



Figure 4 – Levittown Brochure.
 From <http://www.antiquetrader.com/article/Levittown_the_birth_of_the_burbs>

Residents, particularly housewives, were encouraged to decorate the interiors of the home to express their individuality. In the early 1950's, Bill Levitt created a contest to encourage house decoration.⁴ Figures 5, 6, and 7 show the first, second, and third place winners.



Figure 5 – Interior First Place.
From <<http://tigger.uic.edu/~pbhales/Levittown/Decorating.html>>



Figure 6 – Interior Second Place.
From <<http://tigger.uic.edu/~pbhales/Levittown/Decorating.html>>



Figure 7 – Interior Third Place.
From <<http://tigger.uic.edu/~pbhales/Levittown/Decorating.html>>

2.2 Radburn – Town for the Motor Age

Radburn, located in Fair Lawn, New Jersey, represented one of the first planned communities in the United States that featured "automobile-adaptive community design" principles.⁵ The plan for Radburn developed from many meetings between members of the Regional Planning Association of America (RPAA), a group founded in 1923 by "like-minded architects, engineers, economists, and sociologists". Preliminary design meetings were informal and eventually grew into more formal sessions attended by social scientists as well as other professionals, since an important aim of the group was to "[alleviate] social tensions with a better planned environment." To summarize the planning process of Radburn, "[it] reflected a multidisciplinary synthesis of the most current data and expert advice."⁶ Henry Wright and Clarence Stein were responsible for much of the Radburn design, including its interior green parks and the idea that "residents and cars should not mix within the primary community space".⁷ These progressive features helped set Radburn apart from other suburban communities and initiated the discussion of how to integrate pedestrian and vehicular modes of traffic within suburban community design.

Radburn was originally conceived for approximately 30,000 residents; however, the financial collapse in 1929 stunted its growth and resulted in a town for 3,000 residents with a commercial center.⁸ Dubbed the "Town for the Motor Age", Radburn was considered "the prototypical American suburban expression of Ebenezer Howard's 'Garden City'".⁹ In contrast to the focus of many suburban housing plans on the garage and ultimately the automobile, Radburn's plan intentionally shifted the focus to the rear of

the house plan, away from the streetscape. It is there that community interaction is fostered via accessible open green spaces and pathways that offered the opportunity for greater connections amongst residents. In this way pedestrian and vehicular traffic were literally separated. The inclusion of cul-de-sacs in the design of Radburn's "Superblocks" helps limit automobile trips to mostly local traffic, further de-emphasizing the automobile. With the integration of schools in the plan, the concept of Radburn logically appealed to many families looking to safely raise their children in suburbs. With the use of pedestrian overpasses, a child can safely walk from home to school without coming in contact with any automobiles.

Radburn has had a lasting influence on community design, and many of Radburn's conceptual features have been reproduced elsewhere, including cul-de-sac street layouts and superblocks. An important example of Radburn's influence can be seen in the design of Village Homes, in Davis, CA. Figure 8 is an old advertisement for Radburn, illustrating the importance of media in the development of the suburbs. Figures 9 and 10 are diagrammatic images showing the layout of a typical Radburn block and highlighting the different zones and introversion.



Figure 8 – Radburn Advertisement.

From <http://www.northjersey.com/arts_entertainment/91789629_No_Title_-_fairlawnb10422.html>

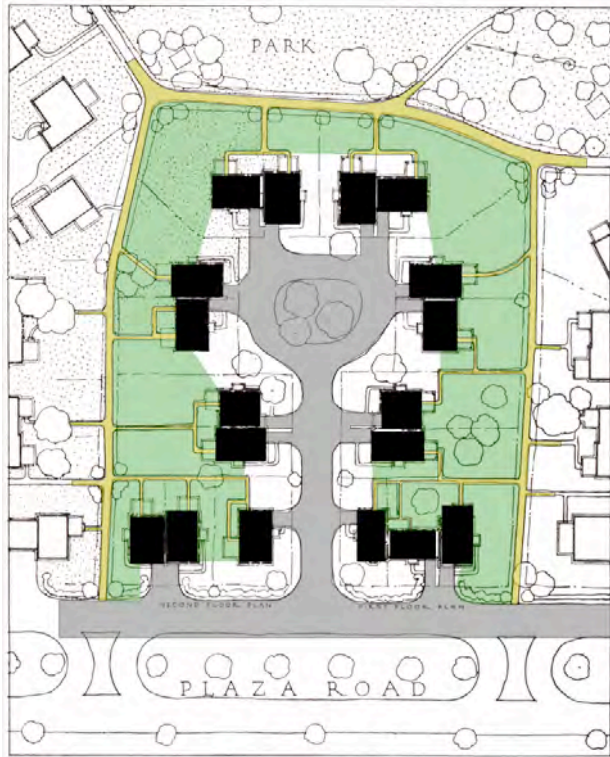


Figure 9 – Radburn Diagram by Author.
Underlay image from *Towards New Towns for America*.

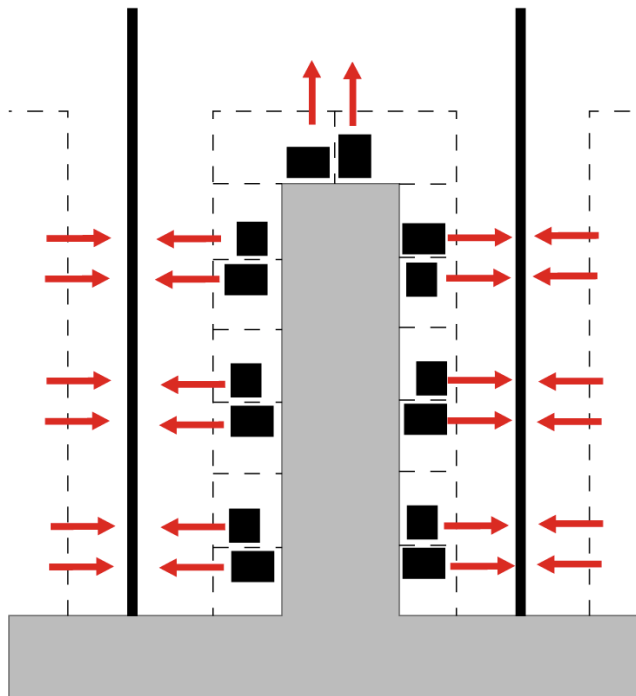


Figure 10 – Radburn Diagram by Author.

2.3 Village Homes – Building on Radburn

Village Homes is an innovative housing development that started in 1974 and portrays a successful subdivision development that differs in many ways from what has become a “typical” sprawling suburban development. When building was complete, in the late 1980’s, Village Homes included 220 single-family residences, 20 apartments, and a cooperative building. The cooperative building includes a pool, multi-purpose meeting & entertainment rooms, and a large playing field. The development has integrated sustainability aspects, minimal infrastructural loading, and a high quality of living. It began with developers Michael and Judy Corbett, who designed and built Village Homes.

Looking at some of the many well-integrated sustainability concepts, it seems reasonable to begin with the approach. This project began with a plan for construction to be “phased in over 5 years” in order to ensure high quality work and “sustained work for builders”. Already it is vastly different from many sprawl developments that are completely focused on profit margins and timetables. Ensuring work for a period of 5 years has the ability to help *sustain* a community. The developer also permitted builders to purchase 40% of the total lots, thereby allowing a degree of variation and encouraging a certain “pride-of-ownership”, as several builders built their own homes. It also probably meant the developer was intending to maximize social capital and create a cohesive community, rather than focusing on the bottom line. Numerous characteristics of the development, including shared laundry facilities, shared common areas, shared gardens, shared vineyards and fruit trees, and shared bicycle and walking paths, all aggregate to empower the sense of community within Village Homes. It is very much like a village. And some benefits of the village-like lifestyle include residents knowing over twice as

many neighbors as compared to residents in typical suburban development, as well as crime being “virtually eliminated” at only “10% of the city average”.¹⁰

Street orientation also has a big impact in Village Homes. The streets are oriented East-West which results in houses being oriented North-South, thereby maximizing the passive solar impact of the sun. For hot summers, shading devices on the houses as well as plantings help decrease heat gains from the sun. Narrow streets also help mitigate the impact of the hot summer sun through reducing the amount of asphalt present, and so reducing the heat island effect. There are no sidewalks bordering the roads as pedestrian and bike paths are located offset from the street, and at times cutting through community areas to promote interaction between neighbors. Another incredibly innovative response that Village Homes took was to site the homes to open onto the community areas rather than the street. This resulted in a small private area, sometimes enclosed, being located on the street side of the house, and a more communal, village-like area being located on the opposite side. The method the designers dealt with drainage is also interesting, as a “network of creek beds, swales, and pond areas” encourage absorption of rainwater immediately after it falls, thus minimizing the impact of rainwater on storm drainage and infrastructures.¹¹ So instead of trying to pipe water to a centralized location, and then getting rid of it, rainwater is dealt with at the site it falls. Open space also plays a big part in the development and such small street networks and conservative home sizes increase the amount of it.

Many aspects of the Village Homes development seem counter-intuitive, but it seems clear that the quality of life of its inhabitants is high. Siting the houses to face the communal village areas instead of the street seems to work well and helps create a cohesive network of neighbors that then increases social capital in the neighborhoods. I

wonder why disregarding the street as the organizing element of developments hasn't taken on more credence since the completion of Village Homes. I was surprised to learn that many of the streets within Village Homes are cul-de-sacs, as they are often considered divisive and have un-sustainable elements to them. But in this case, importance is placed on the rear communal areas, which really become "front" yards, and in this case the cul-de-sacs do a great job of creating nodes and pockets for these communal spaces to develop. Figure 11 is an image of the pedestrian artery in Village Homes. Figure 12 and 13 layout diagrams.

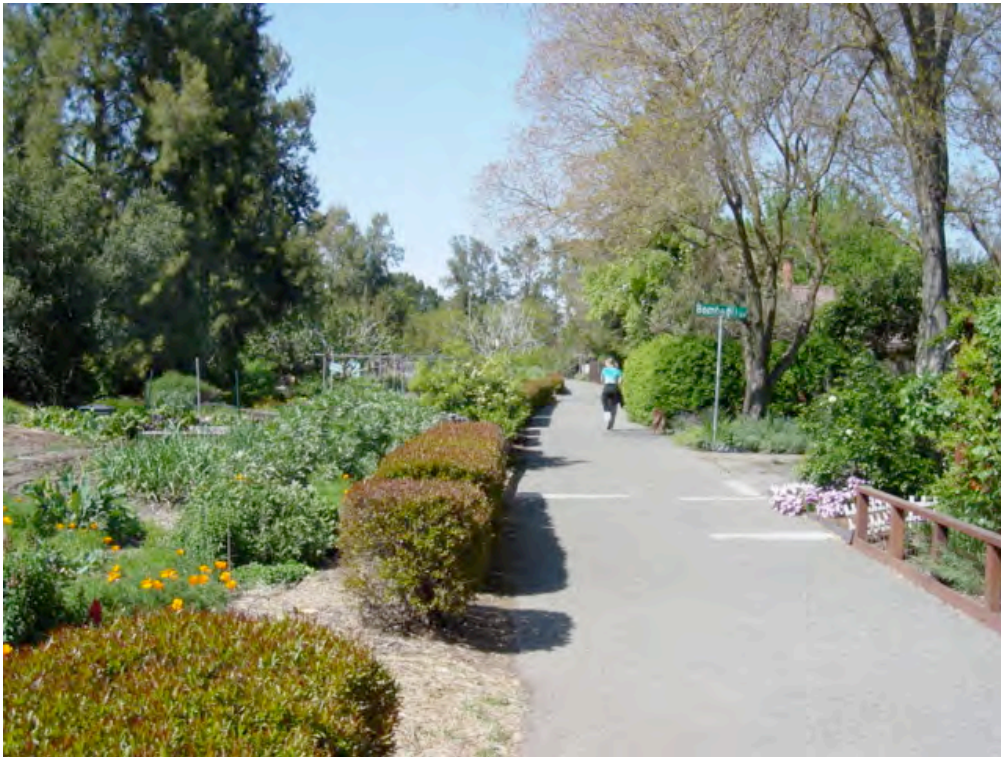


Figure 11 – Village Homes Interior Street.
Image from Google Maps.

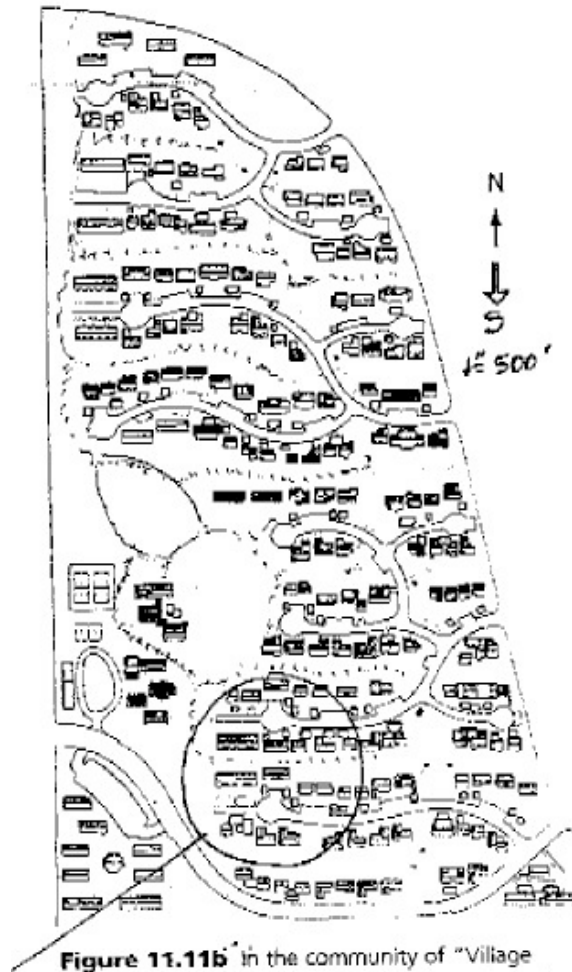


Figure 11.11b In the community of "Village Homes" in Davis, CA, most streets run east-west for winter solar access and summer shading. (From *Village Homes' Solar House Design* by David Bainbridge, Judy Corbett, John Hofacre. Rodale Press, 1979. © Michael N. Corbett.)

Figure 12 – Village Homes Diagram © Michael N. Corbett

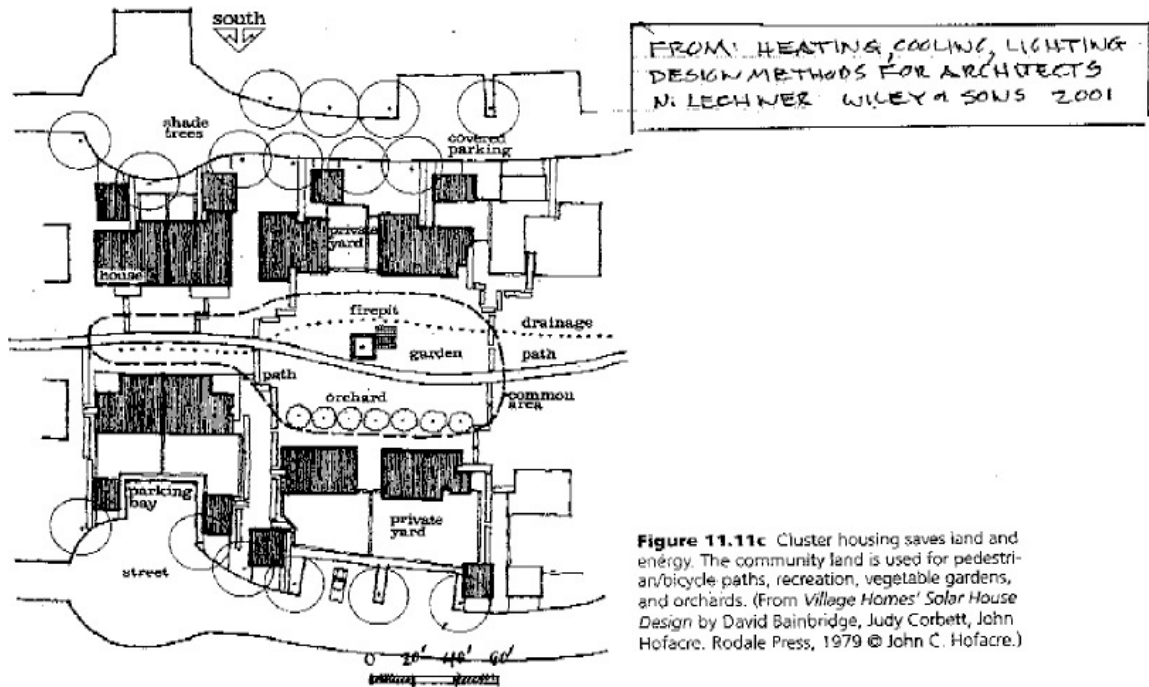


Figure 13 – Village Homes Diagram © John C. Hofacre

2.4 Seaside, Florida – New Urbanism

Seaside, Florida, was created by developer Robert Davis and founded, in 1979, as a "community designed in the image of the past as a prototype for the future." Davis inherited an 80 acre parcel of land from his grandfather located in Northwest Florida, and proceeded to develop the parcel in the late 1970's. Desiring a shift from contemporary housing design, Davis used the "nineteenth-century beach house" as a precedent for the design of the new community. Architects Andres Duany and Elizabeth Plater-Zyberk were hired to help design the community, and together the three of them designed the street layouts, town centers, and residential buildings. The town opened in 1981, and existed as an alternate to the comparable communities that were being designed around the same time. Seaside took odes from classical architecture, and influences from a "catalog of town components identified through the planners' research and survey."¹²

Built largely on New Urbanists principles emphasizing community over privacy, Seaside provided pedestrian-friendly streetscapes. Retail and cultural centers were within walking distance from most residences. Architectural style in Seaside is limited to a certain style (beach cottage), although subtle variations from home to home exist. Homes along appealing boulevards running into the center were reserved for more wealthy homeowners.

New Urbanism presents some interesting concepts and approaches to dealing with suburban sprawl. It is a movement borne out of the unsuccessful aspects of the suburban sprawl, including the strip malls, highways, and non-pedestrian oriented streetscapes. New Urbanism communities attempt to create cohesion on a community level by emphasizing the pedestrian and de-emphasizing the automobile. Garages are often located in back alleys, away from the front facades of homes.

Many criticisms of New Urbanism exist. A few worth noting are social inconsistencies and lack of character. Firstly, using Seaside as an example, New Urbanism communities do not provide adequate opportunity for a variety of social statuses. Seaside is a very expensive community to live in and affordable housing is not adequately addressed. In looking at the development layout, desirable housing along the main corridor with slightly larger lot sizes is reserved wealthy individuals, while more affordable housing is located much further away from the center, although these lots are still quite expensive. Looking at the diversity of housing types in Seaside, it is almost entirely comprised of similar-styled single family detached housing. Variation is attained in housing plans, but most significantly through color.

2.5 Eichler Homes – California Modern

In the past, “suburbia entailed a temporary venue for intellectual contemplation and social entertainment that escaped some of the capital city’s rigorous protocol; it served as an Arcadian retreat rather than a permanent residence.” Suburbs have since become more permanent than temporary and the majority of people living in them reside there on a more permanent basis. Just as they have become more permanent they have also become more affordable, and instead of only serving wealthy merchants and businessmen, suburbs are now widely seen as middle-class communities. This change in status of suburban inhabitants began largely with the postwar housing-crisis.

Developers looked for larger plots of land to construct multiple houses on, and turned to “inexpensive sites on the outskirts of large cities” for development. In these locations city and town municipalities were less likely to enforce strict building regulations and developers could mass-produce houses, thereby enjoying economies-of-scale and, ultimately, requiring a lower purchase price. This version of the suburban home moved away from the large opulent home in the countryside towards a more compact and affordable residence. The federal government also helped influence the widespread acceptance of suburbia, as the Federal Housing Authority (FHA) financed millions of mortgages, which allowed families to move into suburban homes.

Suburban homes were typified by their reliance on the automobile and emphasis on the family, and their construction further emphasized both. Grand “[picture windows]...placed...events of family life on display”, while sizeable garages positioned with easy access to the street housed the real culprit of sprawl; the automobile. Both the

family and the automobile were key marketing tools in the development of suburban residences. Automobiles allowed instantaneous freedom, and the suburban residential home allowed freedom for private family life to thrive. Many advertisements focused on the idea of the nuclear family.

In looking at successful suburban residential design, especially in the postwar years that spurred the growth of the suburbs, it is necessary to look at the work of Joseph Eichler. Eichler was born in New York City in 1900, and eventually married Lillian Moncharsh. Much of Eichler's commitment to modern design was influenced by his wife. He earned a business degree from New York University and worked on Wall Street, eventually leaving for the West Coast to be Chief Financial Officer for his in-laws wholesale foods business. In 1943 he had the opportunity to live in a Frank Lloyd Wright Usonian house in the Bay Area. In 1945 Eichler left the company and, after spending more and more time in the home and learning to appreciate the intricate detail of Wright's design, became intrigued by the idea of bringing the aspects of Wright's designs to the working-class homeowner. In 1947 he started the Sunnyvale Building Company and offered prefabricated homes to buyers who already had lots, and eventually moved into development.

Eichler's approach to designing suburban communities focused on developing "modern" homes, in spite of the lack of public acceptance of modern design and the certainty that "such houses held limited market appeal". Further, many builders had not accepted modernism's "unconventional building methods", including the use of different materials, layouts, and details. To design his modern homes and small apartment complexes, Eichler hired "progressive California architects". Hiring architects to design the model homes was an expense that many developers of the time saw as unnecessary – but it

helped to set Eichler Homes apart from other residential developments. The homes he developed, in fact, were so different from suburban homes of the time that “little separated Eichler’s houses from the avant-garde, custom designed houses of the time.” Against a backdrop of monotonous, cookie-cutter designs lacking individuality, Eichler’s homes appeared quite different. Figure 14 shows a brochure for Eichler Homes.

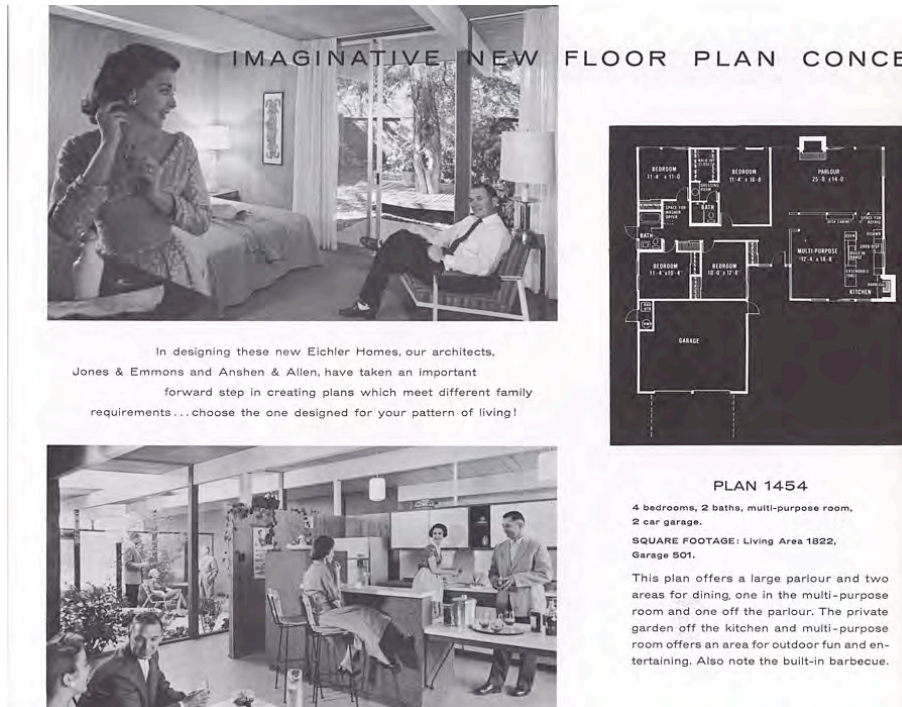


Figure 14 – Eichler Brochure.
 From <http://totheweb.com/eichler/brochures/highlands_brandywine/index.html>

Modernists of the time, including Richard Neutra and Rudolph Schindler, had been experimenting with new materials, including cast-in-place concrete and steel framing. These materials, and variations on them, would prove to be well suited to mass-produced housing types. Many aspects of Eichler Homes borrowed techniques used by other architects, including radiant-floor heating and “technical features” from Frank Lloyd Wright’s Usonian houses. Built-in appliances, modernist clean lines, and post-and-beam

construction resembled a custom-built home, especially next to typical suburban housing of the time. Eichler Homes also blended the indoor with the outdoor by incorporating large all-glass walls that looked out onto gardens, voids in the concrete slab which allowed plants to grow indoors and interior atriums that allowed personal outdoor space. Figure 15 shows an interior space with plants growing through voids in the slab.



Figure 15 – Eichler Interior Image © Ernie Braun

Landscape architects gave great consideration to the overall layout of his suburban communities on both a micro and macro level. Driveways were varied for different housing types and entryways were integrated into the driveways to ensure smooth transitions from inside to outside. These elements added to the overall cost of the homes and brought a typical Eichler home during 1953 in between \$14,000 and

\$20,000, while a comparably sized suburban home in the area went for \$7,000 to \$8,000.

Eichler Homes adopted a “back-to-front” approach to layout and generally placed the “living and dining rooms” in the back of the house, allowing a closer interaction with nature. In seeking a greater connection with the outdoors, terraces or patios were almost always located off private living rooms, and in certain arrangements were centrally located, thus establishing an outdoor connection with multiple spaces within the home. Figure 16 demonstrates the back to front approach to layout.

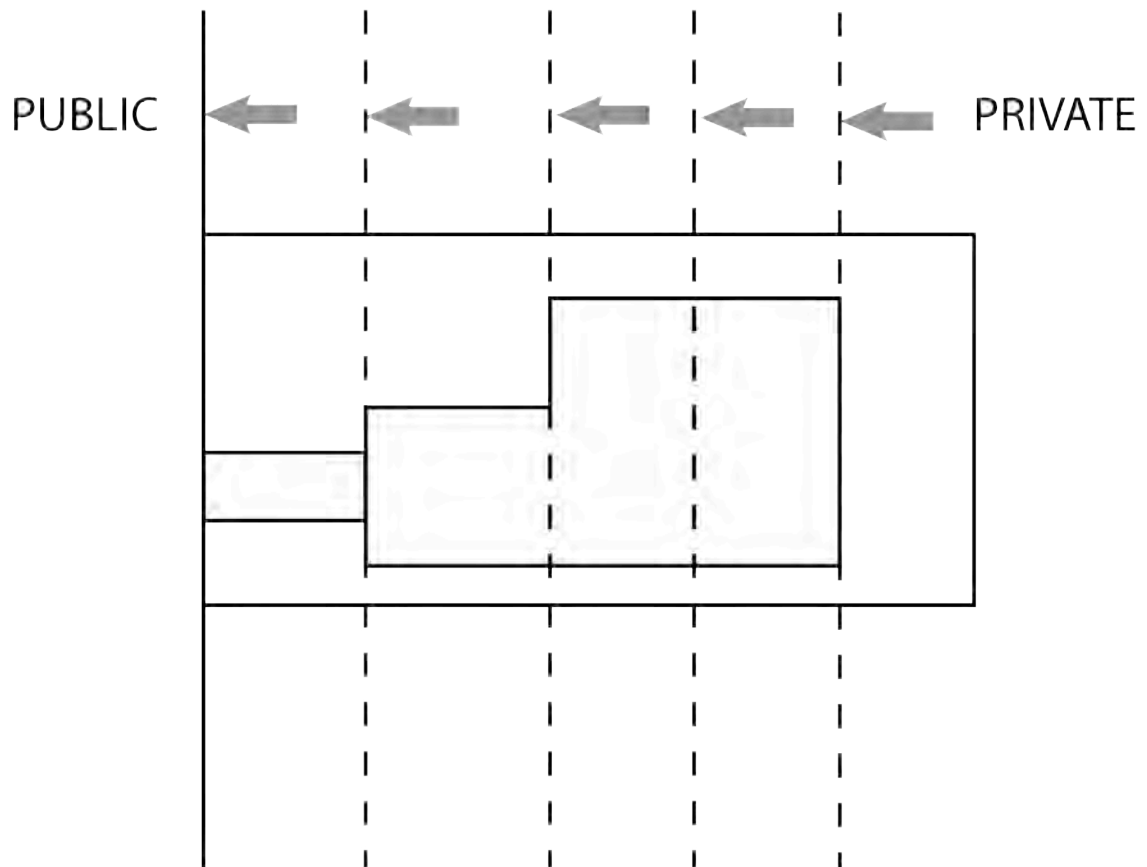


Figure 16 – Eichler Layout Diagram by Author

This type of layout created a clear filtration from front to back that offered changing degrees of privacy. Private atriums also provided controlled outdoor areas that

complemented the interior private areas in a way that exterior yards, front or back, could not. Figure 17 shows the placement of a typical atrium.

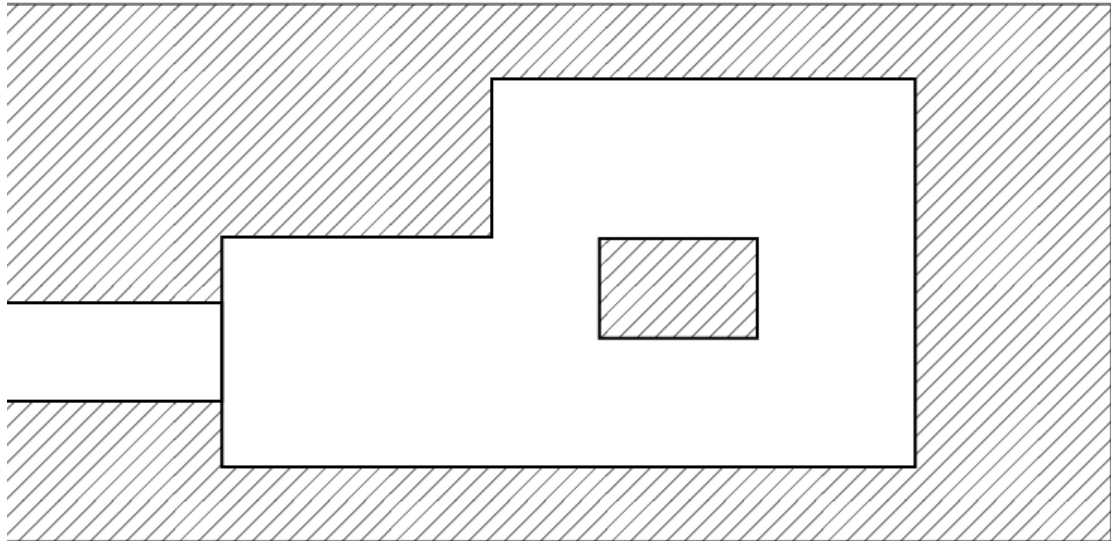


Figure 17 – Eichler Layout Diagram by Author

Cars were an integral element in suburbs, so garages were generally placed in the front and center of the house. Such a prominent placement also allowed social status implications to be read from the street, as expensive cars could be put on display in the drive or housed within the garage. Generally, two entrances to the homes existed; a private entrance through the garage and a more public one that snaked around the garage to the entryway.

The layout of houses in Eichler's developments employs an innovative "radial pattern", which improves on the monotonous character of comparable suburban developments with their long repetitive houses that seemingly continue indefinitely, by establishing a closed streetscape that enhances privacy. This pattern allows similar units to be individualized through subtle changes and the curving street does not reveal the repetition and cuts off any frame of reference. Ultimately, this pattern was not repeated

due to a disorientation problem with residents. However, the idea of moving away from long streetscapes pervaded Eichler Homes' designs, and many future developments allowed subtle shifts in street direction and small clusters of homes to contain streetscapes and maintain a more delicate scale. A sense of community was further enhanced with the inclusion of centrally located community centers in many developments, including Greenmeadow, Palo Alto.

Eichler Homes' designs, in many ways, represent a clear democratization of modernism. Providing homes that hint at custom-design but are produced in such numbers that keep costs down has the ability to reach a much wider audience than typical custom-designed residences.

An innovative approach that encouraged a “cooperative relationship among the architects” allowed many novel inventions for Eichler Homes. Often, when multiple architects work on the same development a competitive environment favoring individual recognition develops. In the case of Eichler Homes, however, this approach was intentionally avoided in favor of a collaborative effort, which “allowed ideas to be traded in an open forum.” In many ways this is similar to an integrated design process, which is increasingly advocated by LEED and similar sustainable design programs to enhance efficiencies and collaborative team approaches. In the case of Eichler Homes, however, they were doing it 50 years earlier.

Stick-built housing requires readily available materials and less technical knowledge than other styles of framing, such as steel and prefabricated systems. Eichler Homes started with a prefabricated approach to building, but eventually the developments moved away from load-bearing walls and adopted post-and-beam construction. Post-and-beam

construction, they found, offered numerous benefits, including: less material; a “simplified...erection process”; wider spans; various, flexible layouts; “greater ceiling [heights]”; quicker erection time. They coupled this post-and-beam approach with slab-on-grade foundations, which allowed less excavation and a capitalization on concrete’s inert insulative value, especially when combined with extensive glazing on the southern façade.¹³ Further, radiant floor heating took advantage of the heat-sink value of concrete. The different systems used in Eichler Homes work together, each augmenting the other.

In looking at the appeal of large lots and the sense of “private” space and ownership, the interior atrium seems like a logical substitution that, although at a much smaller scale, can satisfy the need for a controlled outdoor environment that many people desire. The front and back yards, unless contained by physical fences or walls, do not offer a wholly personalized space that blends the feeling of private isolation with being outdoors. Fences and walls, further, contribute too much discontinuity by emphasizing the personal property line.

2.6 Skinny Homes Infill Strategy – Portland, Oregon

Increasingly, infill lots in developed areas are being targeted for development. A publication released by the City of Portland, Oregon, defines in-fill housing as “development on vacant land within established residential neighborhoods”. As cities and suburbs become more and more populated, vacant lot sizes decrease, and the residual spaces are often “skinny” lots, at 25 feet wide and sometimes less. In response to a growing effort to develop these “skinny” lots, Portland established a Living Smart

House Program in 2003 to specifically address infill development on narrow lots. The program included a competition to design in-fill housing for 25 foot wide lots and ultimately deemed the winner's designs as permit-ready plans for public adoption. In doing so, the City of Portland enticed prospective developers of skinny lots to use a design the city had designated as agreeable. The City of Portland judged designs based on a large set of criteria, including, "welcoming facades" that place the pedestrian entrance in a "pleasant and predominant manner", garages or car-ports that integrate well with the rest of the residence, and well-articulated facades. Distilled down, the judging criteria are "intended to create lively neighborhoods in which public interaction is fostered but where privacy is also valued."

In-fill development in general has the ability to capitalize on existing infrastructures and thereby minimize sprawl. In the specific case of skinny houses, it is effectively increasing density within residential neighborhoods while maintaining the appeal of single-family detached living. Of course, there are obvious benefits to this kind of in-fill development as well as negative consequences that need to be addressed. The nature of skinny lots almost necessitates a two-story residence, given traditional setback requirements that often further reduce the building width.¹⁴ To ensure skinny houses integrate well into the existing context, care must be given to their appearance and architectural scale. By nature they stand out, especially in tract communities with a limited building variety; but by taking care to address scale and appearance within the larger context, skinny houses have the ability to integrate well into existing communities.

Figures 18 and 19 are images of Skinny Homes houses.



**Figure 18 – Skinny Homes Image.
From the City of Portland, Oregon.**



**Figure 19 – Skinny Homes Image.
From the City of Portland, Oregon.**

CHAPTER 3

SIMI VALLEY

3.1 Layout of Simi Valley

Simi Valley, CA, is located almost 40 miles northwest of Los Angeles, CA, and encompasses approximately 42 square miles.



Figure 20 – Southern California Site Context by Author

It is located in Ventura County, CA, and has approximately 126,366 residents. The population has increased significantly, and from 1970 – 2006, it went from 59,832 people to 122,708 people, which is about 2% per year. The demographics of the city are skewed towards an older population, with the 18-35 age group decreasing considerably. Being in that age group and knowing a lot of people in that age group, I can say that a lot

of people are moving because Simi Valley is disconnected from any major downtown or urban area. As a result, household sizes are getting smaller, going from 4.15 people per household in 1970 to 3.04 people per household in 2006.¹⁵ Looking at the physical setting of the city, it is surrounded on 4 sides by a natural mountainous topography, with rolling hills and natural valleys. In the center is a valley floor, which is fairly level and contains the majority of the development in Simi Valley. Increasingly, however, newer tract developments and subdivisions are creeping into the hillside areas. The climate in the city is temperate, with hot dry summer days and mild-cool winters. Agriculture used to be a significant business in Simi Valley, with lots of avocado and orange production, but now is more dominated by the service, hospitality, and general merchandise industries. Job sectors also include management, finance, and insurance, but at a much smaller amount. There is a discrepancy between average home prices and average income, as well. Increasingly, jobs in surrounding areas are more lucrative and a sizeable number of residents live in Simi Valley and work elsewhere. The mean home price in 2009 was \$631,871, while the per capita income in 2009 was \$31,678.¹⁶ Looking at the younger population, it is obvious that residences in Simi Valley are simply not affordable.

The land-use distribution across Simi Valley is very scattered. Residential space is about 35%, open space is about 35%, and the rest is split between commercial, industrial, and public/semi-public.¹⁷ Most of the commercial development is along the arterial streets but is significantly disjointed, with patches of residential and industrial separating the commercial developments. A highway bisects the city, and creates northern and southern subareas, with the southern occupying about 75% of the city square footage. There is an existing bus system in Simi Valley, but it does not

adequately address the needs of the city. It does not reach the majority of the valley and is under-developed for the size of the Simi Valley's current population. There is also a train stop in Simi Valley that links the city with areas both North and South of the valley, but not multiple stops within the city. In order to encourage greater walkability around the city, both of these public transportation systems need to be developed further.

Simi Valley, like many cities in Southern California, imports the majority of its water, creating a large burden on the water supply in California. Many sprawling cities have this kind of effect on public infrastructure, and densification is an approach that alleviates much of these stresses. Concentrating future development in areas that already have access to public utilities will impact the city in a positive way.

Arterial streets in the valley are organized along a grid, and from East-West they carry about 80,000 – 90,000 trips daily, while North-South arterials carry about 90,000-195,000 trips daily. These are un-walkable streets. A large amount of the remaining streets are “collector style” streets, and these do not create connections but rather create divisions. Cul-de-sacs are an example. Turning these *collector* streets into *connector* streets, as Peter Calthorpe often talks about, has the ability to take loads off of arterials and onto the collectors, while still maintaining a level of walkability on all streets.

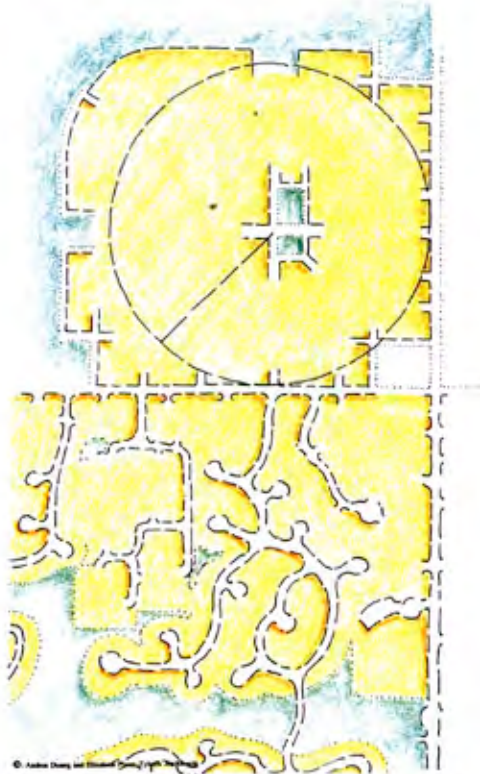
However, Village Homes is an example wherein cul-de-sacs do work, but in this case there is a significant development of pedestrian trails and walkways away from the street. For Simi Valley, a medium between these two approaches would be significantly beneficial. Looking towards the future and at potential redevelopment strategies for existing residences in Simi Valley, it seems clear that a degree of densification is needed. Simi Valley's new General Plan realizes that new development should be “[redirected]...inward rather than continued outward expansion into the surrounding

hillsides and natural open space areas." Infilling the voids that exist, especially along highly traveled corridors, is necessary. Creating more walkable streets and decreasing traffic along all streets is also necessary. Maintaining a greater level of variability in housing types, as well as housing prices, would appeal to a wider variety of ages and familial types. The General Plan acknowledges most of these development strategies, citing an overall need to "prioritize infill development and redevelopment...", as well as "[provide] a mix of housing to meet the needs of current and future residents, including an equitable distribution of affordable housing..." and "[encourage] a mix of housing types within neighborhoods to promote a diversity of households for residents of all ages and income levels."¹⁸ Affordable infill development that can be adapted to various site-specific conditions and modulated, in terms of size, to meet a variety of needs, can transform existing neighborhoods from typical inefficient suburban landscapes into communities that meet various needs in an efficient manner. These diagrams present sprawling vs. traditional communities. (Duany Plater-Zyberk & Company)



Figure 21 – Traditional vs. Sprawl Diagram.
 From Duany Plater-Zyberk & Company.

IN THE TRADITIONAL NEIGHBORHOOD IT IS A FIVE MINUTE WALK
FROM THE EDGE TO THE CENTER.



IN SUBURBAN SPRAWL THERE IS NO CENTER,
EDGE, OR WALKING ORIENTATION.

Figure 22 – Neighborhood Layout.
From Duany Plater-Zyberk & Company.

3.2. Design for Re-Development

The Simi Valley General Plan's Land Use section states that future development land use policies reflect a "community desire for more sustainable forms of development that reduce reliance on the automobile, consume less energy and water, and produce less pollution and greenhouse gas emissions. Each of these desired characteristics are considered in my development proposal.

3.2.1 Site Analysis

The site for this project is a block of residential homes located in Northeastern Simi Valley, CA. Figure 23 shows greater Simi Valley and Figure 24 shows the highlighted site.

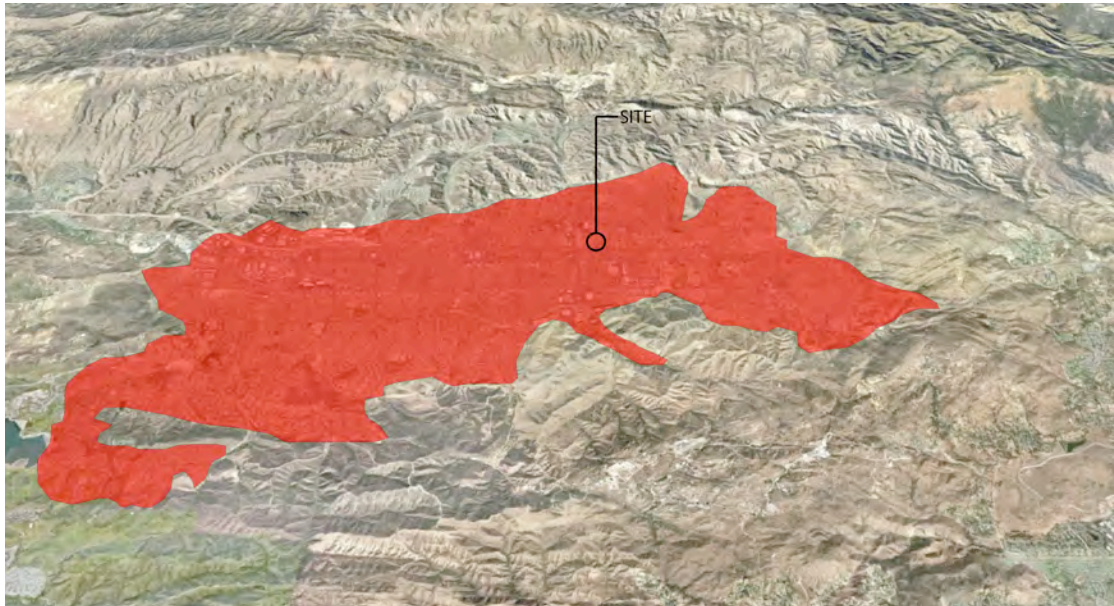


Figure 23 – Simi Valley Floor Diagram by Author.

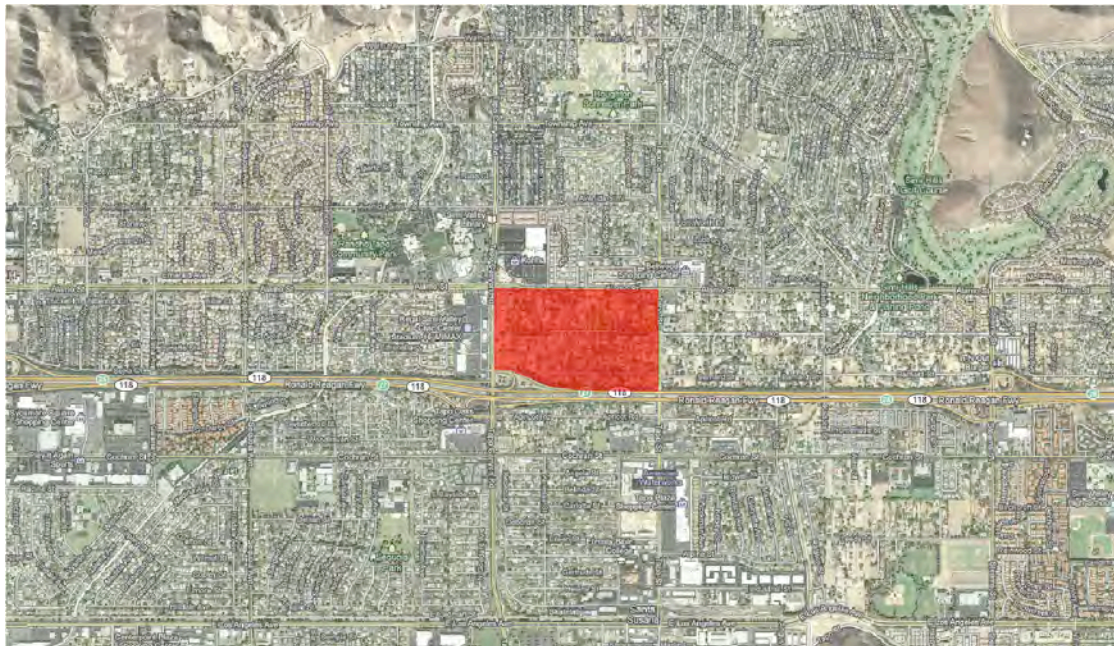


Figure 24 – Site Location by Author.

The block is zoned as RVL (Residential Very Low Density) and has relatively large lots, many of which are up to 300' deep.¹⁹ Bordering the site to the West is Tapo Canyon Road, to the North, Alamo Street, to the East, Tapo Street, and to the South, the 118 Ronald Reagan Presidential Highway. Figure 25 shows circulation around the site.



Figure 25 – Site Circulation Patterns by Author.

The entirety of the block is zoned as residential except for the western frontage along Tapo Canyon Road and a small portion along the northeastern portion of Tapo Street, which are both zoned as commercial. One of the most popular commercial and cultural districts in Simi Valley lies adjacent to the site along Tapo Canyon Road, with many well-used restaurants, retail outlets, and cultural institutions. The Simi Valley Public Library, City offices, and County Courthouse are all located within 1/4 mile of the site. Figure 26 shows the land-use distribution around the site.

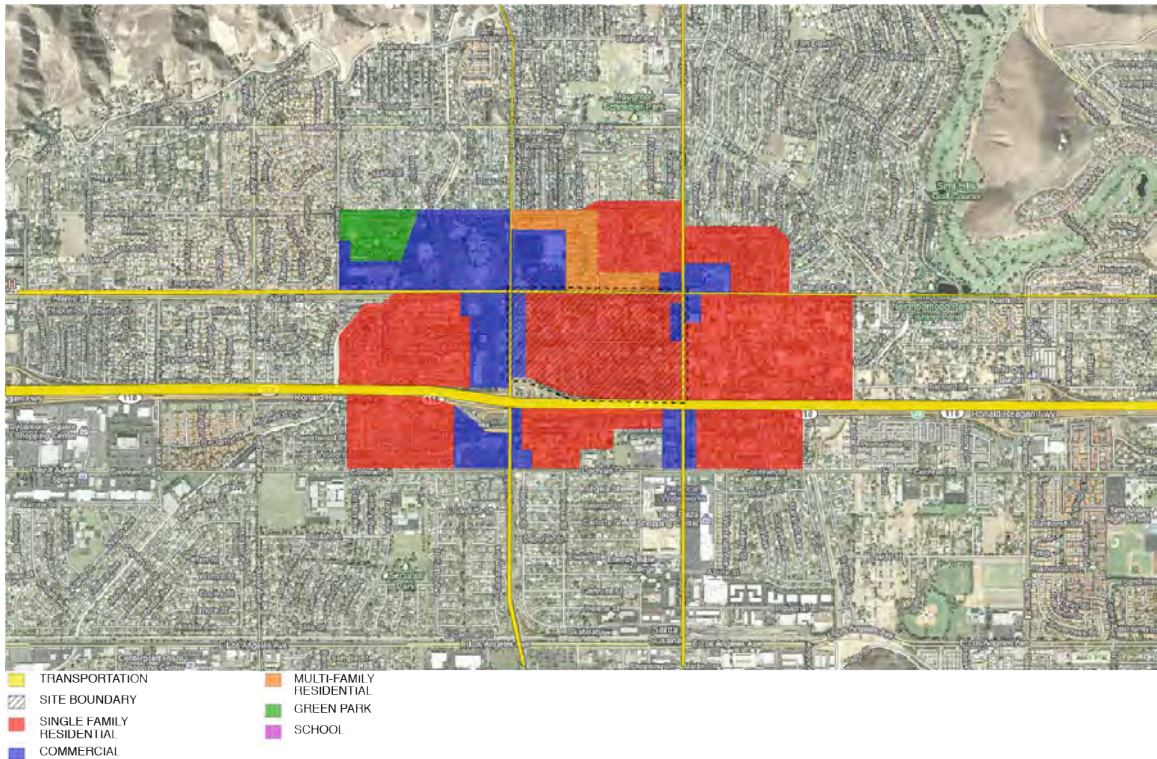


Figure 26 – Land-Use Map by Author.

The site is known as the "Kadota Fig" area, as it used to be a fig farm, and was also previously citrus orchards. Existing residences located on the site are generally ranch style houses of moderate size. Most of the homes were built in the 1950's and 1960's and are around 2,000 - 3,000 square feet. Existing vehicular circulation through the site focuses on two collector streets running East-West. These streets must be accessed from the Eastern Tapo Street and do not extend through to Tapo Canyon Road, the busiest street surrounding the site, and as such the block maintains a residential feeling in spite of being located next to a busy commercial district. If these streets extended from Tapo Canyon Road to Tapo Street the block would be much busier and not maintain its suburban residential character. Pedestrian circulation through the site is very inadequate. The only streets with sidewalks in the site are Tapo Canyon Road and

Tapo Street; none of the internal streets contain sidewalks and are rather unwelcoming. Alamo Street, a well-traveled connector street running parallel with Highway 118, has sidewalks on the northern side of the street but not on the Southern side. Figure 27 shows an existing site plan with corresponding site images.



Figure 27 – Existing Site Plan by Author.



Figure 28 – Site Photo 1 by Author.



Figure 29 – Site Photo 2 by Author.



Figure 30 – Site Photo 3 by Author.



Figure 31 – Site Photo 4 by Author.



Figure 32 – Site Photo 5 by Author.

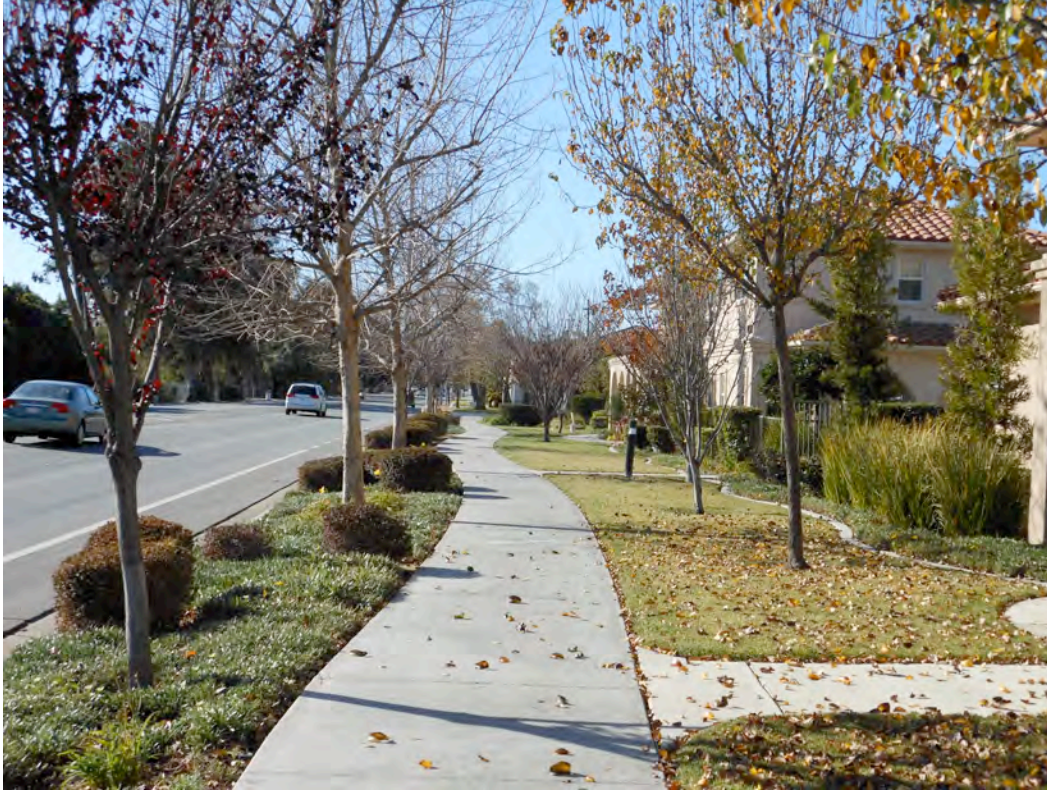


Figure 33 – Site Photo 6 by Author.



Figure 34 – Site Photo 7 by Author.



Figure 35 – Site Photo 8 by Author.



Figure 36 – Site Photo 9 by Author.



Figure 37 – Site Photo 10 by Author.

3.2.2 Infill Strategy

In looking towards the future, the existing suburban community can be significantly densified without altering the allure of its suburban residential character. Part of the draw of suburban communities is their emphasis on individual property and privacy, and their distinct separation from one another. In realizing that suburbs serve a demand, densification to the point of urbanization is not the answer for a redevelopment on this site; a middle ground characterized by an increase in density with a preservation of single-family detached units has the ability to appeal to a broad spectrum of residents. As the vast majority of the housing base is large single-family detached homes, integrating compact one and two bedroom units has the effect of both densifying the area and broadening the housing base, which is considerably skewed towards larger detached homes. Compact housing can also provide an alternative to the expensive housing that pervades the area, as the mean home price was \$631,871 in 2009. The mean price has since gone down but not significantly. This approach also benefits the aging population often looking to downgrade the size of their home as they do not want to care for a large house. Demographically, much of the population that is leaving is either the older generation or the younger generation. Not only will an infill housing strategy that utilizes a variety of housing sizes benefit an older generation, it will also allow a younger generation the opportunity to afford their first home.

This area is widely characterized by dilapidated back yards littered with run-down automobiles and recreational vehicles, and an excess amount of space. Space is generally underutilized, and as such, a proposed increase in density will allow a greater number of Simi Valley residents to reside close to accessible cultural and commercial buildings. This density, however, must be sensitively managed to ensure a seamless

integration with existing landscapes and not create additional underutilized spaces between residences.

3.2.3 Zoning & Lot-Lines

Current zoning restrictions on the site create strict barriers to increasing density and using land more efficiently. Existing zoning allows one accessory dwelling unit (ADU) per primary residence. Increasing this zoning allowance to 4 ADU's per primary residence will allow an increased density and setting limitations on ADU building height(s) to 20' will ensure the community maintains its single-family detached suburban feel. Prevailing setbacks further restrict the efficient use of space on the site by creating unused spaces between structures. A zero-lot line allowance on sides will allow one lot-line to exist as a property border and the opposite to exist as a wider, usable space. Allowing a zero-lot line for the front setback, which is currently restricted to 20', will allow a greater street presence on the block. Internal setbacks stipulating a minimum of 6' between structures will remain, but relaxing other setback limitations will increase the amount of usable space. With an increase in density, such zoning amendments are necessary to ensure usable outdoor space is maximized and efficiently used.

3.2.4 Introversion + Site Plan

Developments like Radburn and Village Homes, discussed previously, create grounded links between residences and the landscapes surrounding them. They address the need for automobiles by providing places for parking and loading/unloading, but recognize that separating pedestrian and vehicular circulation can create welcoming spaces that encourage social interactions instead of inhibiting them. The Kadota-Fig site's existing pedestrian and vehicular circulation is not separated since there are no sidewalks, and

vehicular circulation seems to be the only real consideration. Given the vast depth of existing lots, at up to 300' deep, pedestrian circulation can easily be focused to the interior of the block, similar to Radburn and Village Homes' introverted pedestrian pathways. Figure 38 below demonstrates this introversion.



Figure 38 – Preliminary Introversion Diagram @ Tapo Cyn. by Author.

This approach utilizes what is currently unused space, and provides pedestrian connections that do not presently exist in the site. Figure 39 shows the larger site.



Figure 39 – Site Aerial from South by Author.

Figure 40 depicts a master plan for the northern block of the site, which serves as a model that can be deployed elsewhere on this site, and even at other location within Simi Valley. Figure 41 shows a zoomed in view of the site



Figure 40 – Proposed Site Plan by Author.

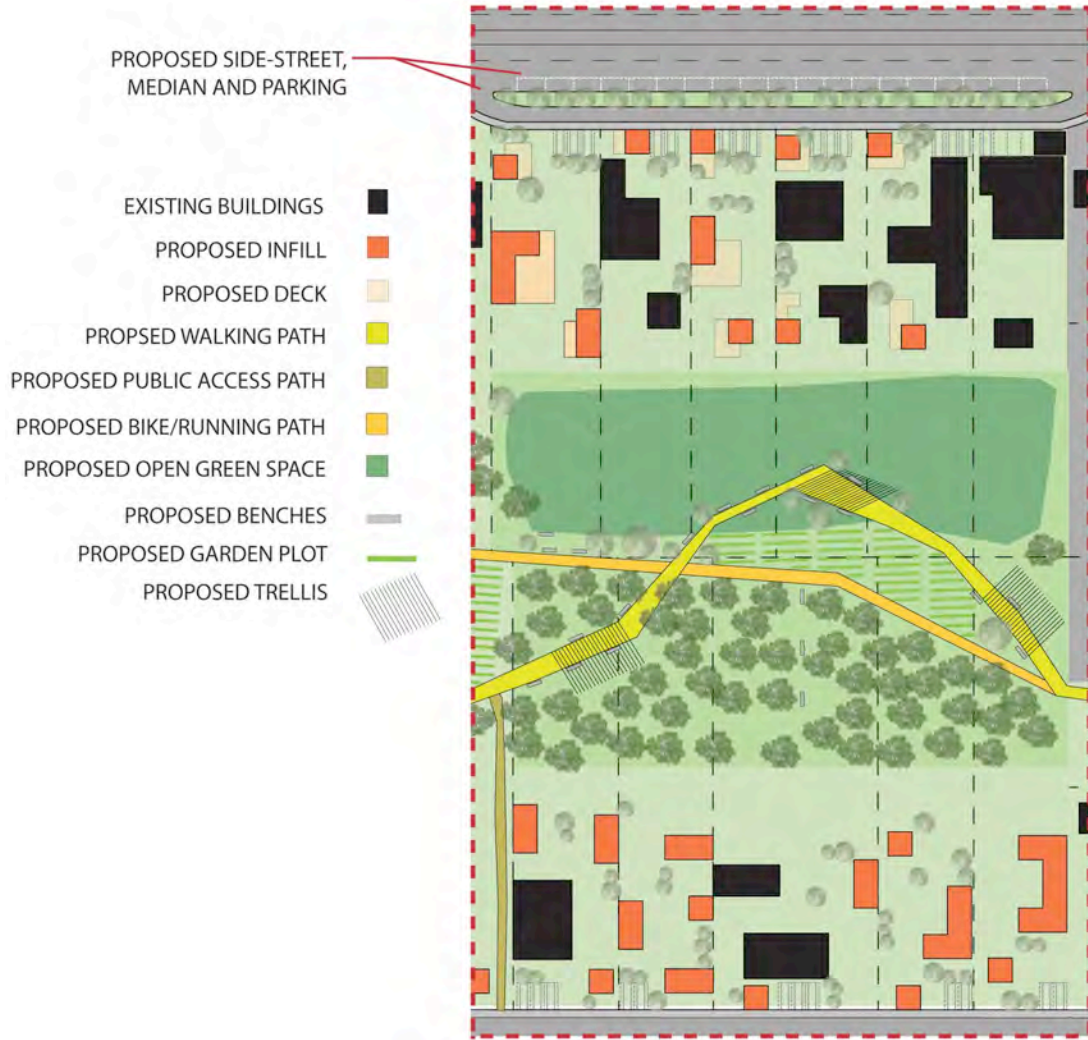


Figure 41 – Proposed Site Plan Focus Area by Author.

The overlying concept is an introversion of the block, focusing pedestrian circulation and activity to the interior of the site, and allowing the housing to front this arterial corridor. This creates a service-oriented street connection reserved for automobile parking and access. The "front yard" of residences is essentially reversed, as it will spill onto the arterial corridor, which will act as a collective "front yard" with greater usable space than presently exists. Similar to Village Homes, this artery will offer garden plots for residents to use and contain small orchards of citrus, avocado, and fig trees, which all connect to

the history of the site and of greater Simi Valley. In addition to these elements, usable outdoor green space for recreation and congregation will address the present lack of outdoor meeting space on this block. Two pathway systems running through the interior of the block, one for quicker traffic, such as biking and running, and one for a more contemplative speed, will intersect to create defined pockets to house the different programs. Drought tolerant landscaping and trees that provide shade will create usable outdoor spaces that respect the Southern California climate and not place a large burden on water tables. Pervious walkways will also allow rainwater to replenish the local aquifer directly where it falls, without adding to the municipal storm water drainage load. In order to create spaces for sitting and congregating along the pedestrian pathway(s), benches and trellises will be located along the paths.

Since this block is relatively large, designing the pedestrian arterial network as a series of replicable systems, each containing pathways, benches, trellises, garden plots, orchards and usable open space, has the ability to allow each cluster of residences to develop its own identity. Each cluster can develop strong ties with adjacent neighbors within the cluster and further with other clusters. This system is also somewhat modular and can be deployed in a variety of different sized neighborhoods. Since there are no sidewalks presently on Alamo Street or Adam Rd., which borders the site to the South, proposing new sidewalks will have the effect of creating more pedestrian access and making the block approachable. Each of the "clusters" will have 2 additional vehicular lanes carved out of the frontage, which will serve as one-way lanes and street parking. A planted median will separate Alamo St. and the on-street parking from the one-way residential lane and the sidewalk. This will create a friendlier streetscape for residents and help create parking for the increased density.

Increasing the density of the site is important and has been mentioned by the City of Simi Valley as a clear development target in the future. This site's proximity to cultural and commercial centers in Simi Valley further justifies increasing its density, in order to provide more housing located close to amenities and encourage greater pedestrian activity. Inspiring infill solutions like Skinny Homes, in Portland Oregon, provide innovative solutions to integrating infill housing into existing landscapes. Utilizing zero-lot line setbacks to organize infill structures and outdoor spaces can allow communities to use space more efficiently.

3.2.5 Property Lines

Another pervading aspect of suburbia, especially in Simi Valley, is the glorification of personal property lines. Figure 42 shows an existing residence on the site with cinder block walls located on property lines.



Figure 42 – Concrete Block Wall by Author.

This can be seen in many developments around Simi Valley, and does have the effect of delineating inaccessible private space for a specific residence. It also creates discontinuity between landscapes and, if done on every property line, monotonous residences that do not fit into any social context. Figure 43 shows how many different layers of fencing exist between abutting houses.



Figure 43- Multiple layers of fencing by Author.

The vast number of fences that line almost every property line, in many cases, create unnecessary barriers that generate often unusable or uncomfortable spaces. Zero-lot line allowances create opportunities to define property lines and private outdoor spaces without the use of a traditional fence. Figure 44 shows an image of a residence in

Charleston, South Carolina in which the neighboring houses structural wall is located directly on the property line, and as such serves as the wall for the neighboring house.



**Figure 44 – Charleston, South Carolina, Zero-Lot Line.
From Google Earth.**

Figure 45 shows a plan view diagram of the housing layout in Charleston, which utilizes zero-lot lines and an opaque northern wall to act as a containing wall for the adjacent residence. Garages at the end of the driveway also act as "walls" for the neighboring house.

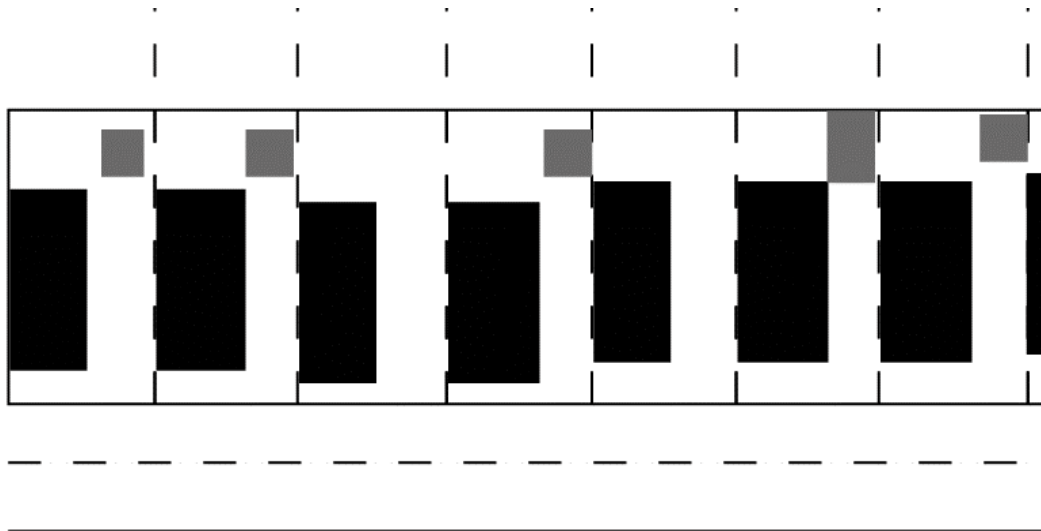


Figure 45 – Plan Diagram of Housing Layouts, Charleston, SC by Author.

Obviously, certain considerations are given to things like window and door placement, with regard to the neighboring home and the joint use of the wall. Since there is no additional fence the wall serves both residences. As a design technique this approach allows a greater connection between adjacent houses and the landscape that surrounds them. Instead of each residence existing in isolation from one another, a dialogue is created over the property line by way of the common wall. Eradicating the landscape of fences, though still maintaining legal property lines, creates an opportunity to use land more efficiently and enhance social connections between residences.

3.2.6 Zones

The Kadota Fig block currently has fairly clear zones of program, with a clear automobile/service zone abutting the street, a residential living zone 20'-140' from the street, and a back yard zone 140'-300' from the street. In thinking about infilling the block, it seems necessary to delineate programmatic zones for different purposes. With an introversion of the block, the front setback is more service oriented and does not

need to serve as a congregating "front yard" anymore. Figure 46 highlights the programmatic zone layout, looking South from Alamo St.

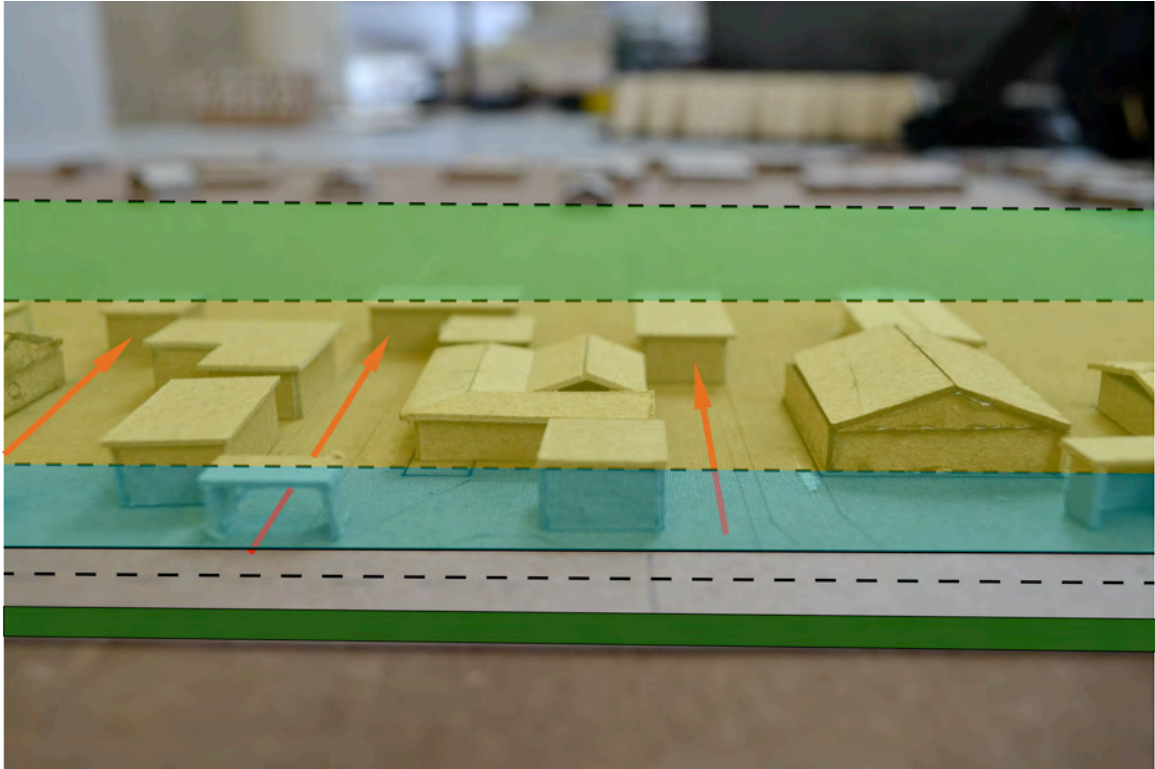


Figure 46 – Preliminary Programmatic Zones by Author.

The first zone from the street is a parking and living zone. Much of the parking will be located on the street, but a few spaces for each lot will exist within the first 25' of the site, and occasionally infill housing will come all of the way to the sidewalk, which will create a strong street presence and a variation in setback from neighbor to neighbor. The second zone will be housing, located 25'-180' from the front lot-line, and will include existing residences and infill housing. Circulation through the site will also cross this zone. The third zone is the community arterial corridor, located on the interior of the block. This large space is set aside for community use, although with rather dense

housing between it and the street, it is somewhat shrouded from the street view. In this way, the residents can begin to feel an ownership for the landscaped community area.

3.3 Housing Design

The actual infill strategy is a variation of moderately sized units. Since the Simi Valley Master Plan cites a need for a variety of housing sizes, a housing system that is flexible is necessary. The infill proposed in the site plan is a combination of primary residences, in the case of lot subdivisions, and accessory dwelling units, which serve to increase density but not overpower the existing residences. Figure 47 is a diagram representing the infill strategy for the site, with green marking infill locations.

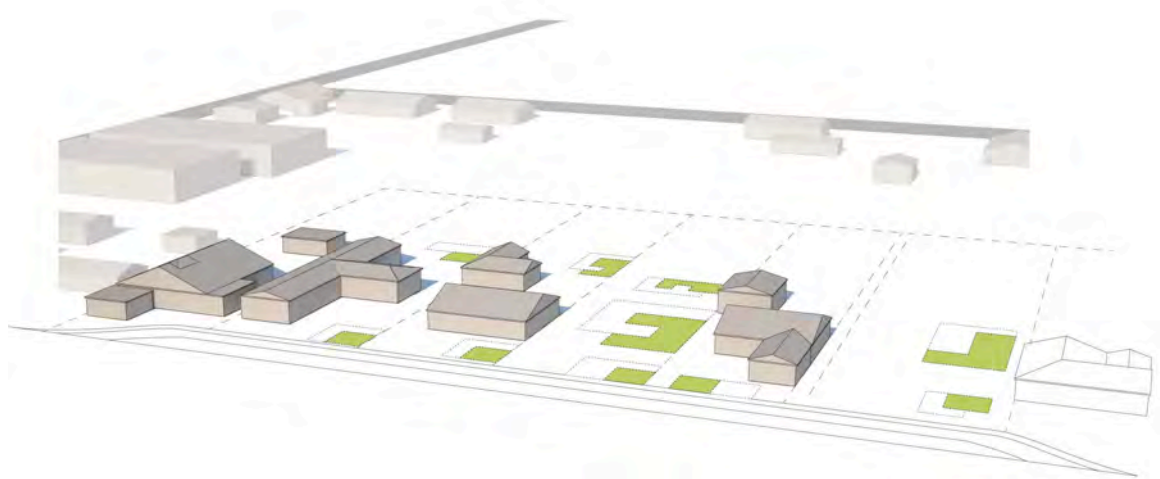


Figure 47 – Infill Strategy Diagram by Author.

The easement located along the existing "L" shaped home on the right of the image serves as public access to the interior green spaces. A similar infill pattern is deployed on the rest of the block with public access easements located every 12 houses.

3.3.1 Building Components

Utilizing the accessory dwelling unit, and larger variants on it, as the infill solution serves to allow a variety of housing sizes that share a common construction method and aesthetic appearance. Since prefabrication decreases construction waste and enhances efficiencies with assembly, a kit-of-parts approach to construction is employed with this housing system. Given that truck beds are a little over 8 feet wide and many components of the house need to be transported to the site for assembly, 8' x 10' SIP panels are used. Structural Insulated Panels (SIP) are wall panel systems that have efficient thermal properties, act as lateral resistance sheathing, and are highly customizable. The panel consists of two layers of oriented strand board (OSB) with a continuous layer of rigid insulation in the middle. At 8' wide these panels can be assembled off-site and trucked to the site for installation, with window units and blocking already installed. Using a simple 8' x 8' grid system as the plan, these panels can plug into a structure and act as wall assemblies. Using a 10' tall panel allows a lot of natural sunlight to infiltrate and reflect off high lofty ceilings in the winter, when the sun angle is lowest. The SIP panels will key into a structural tube-steel frame, based on the 8' x 8' grid layout, and will sit 2" proud on the exterior to maintain a thermal break with the steel. An OSB spline set behind the seam at the junction of two panels, applied with screwed connections, will structurally connect the SIP panels together. Normally, SIP panels are connected via a spline adhered to the rigid foam with an adhesive. This approach, however, does not allow disassembly down the road, and separation of building components is an important consideration in this project. Figure 48 shows a SIP wall detail with steel frame connection.

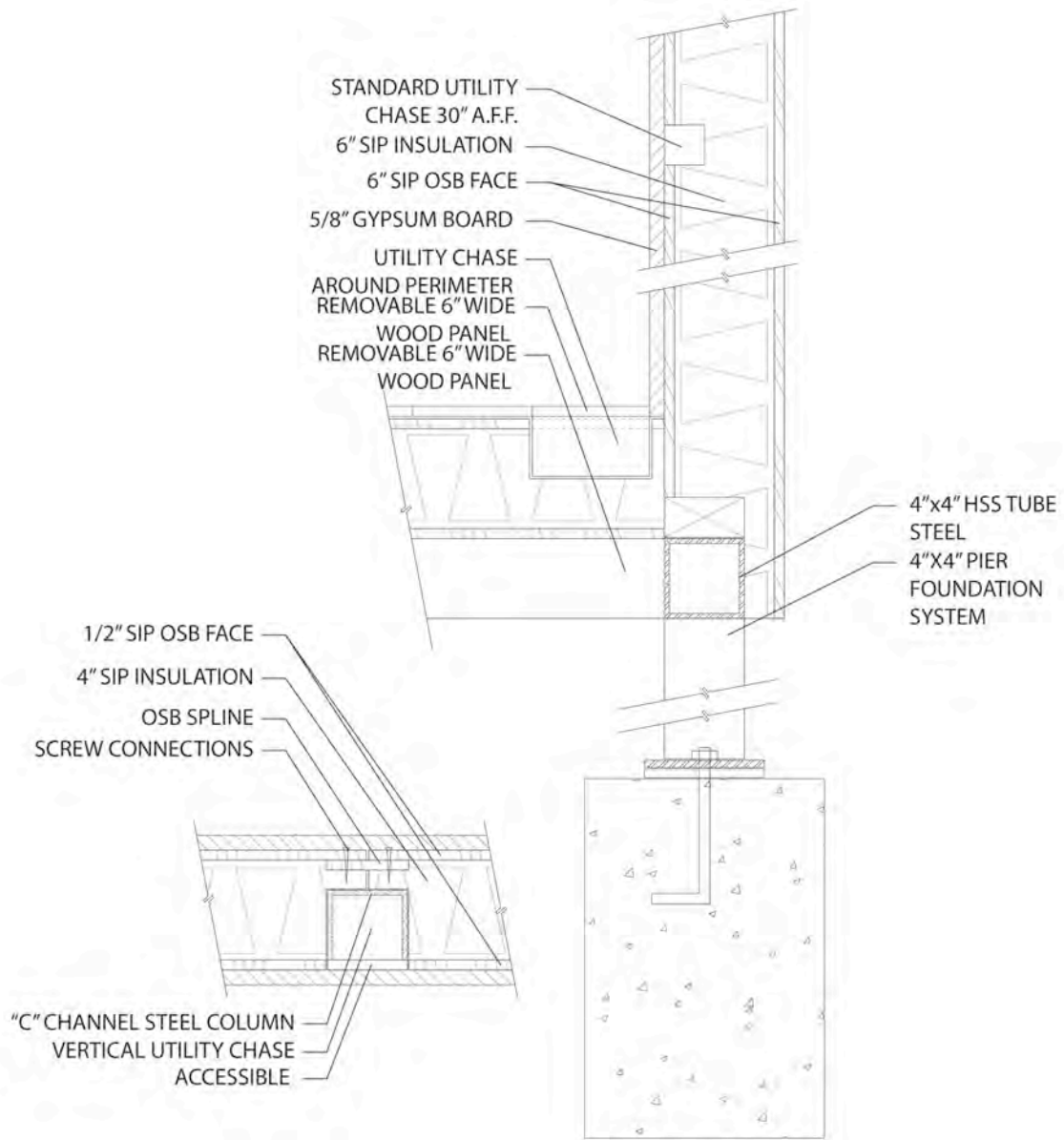


Figure 48 – SIP & Steel Frame Wall Detail(s) by Author.

A steel frame with bolted moment connections ensures deconstruction and future flexibility is possible. Since the steel frame would basically act as a post-and-beam structure, similar to Eichler Homes, wood could potentially be substituted for the steel frame. Steel, however, is entirely recyclable and maintains its structural integrity well. Wood, after time and environmental considerations, as well as small shape changes

under loading, is less able to act under the same structural capacity after deconstruction and is less ductile than steel. Figure 49 shows a typical steel bolted connection detail.

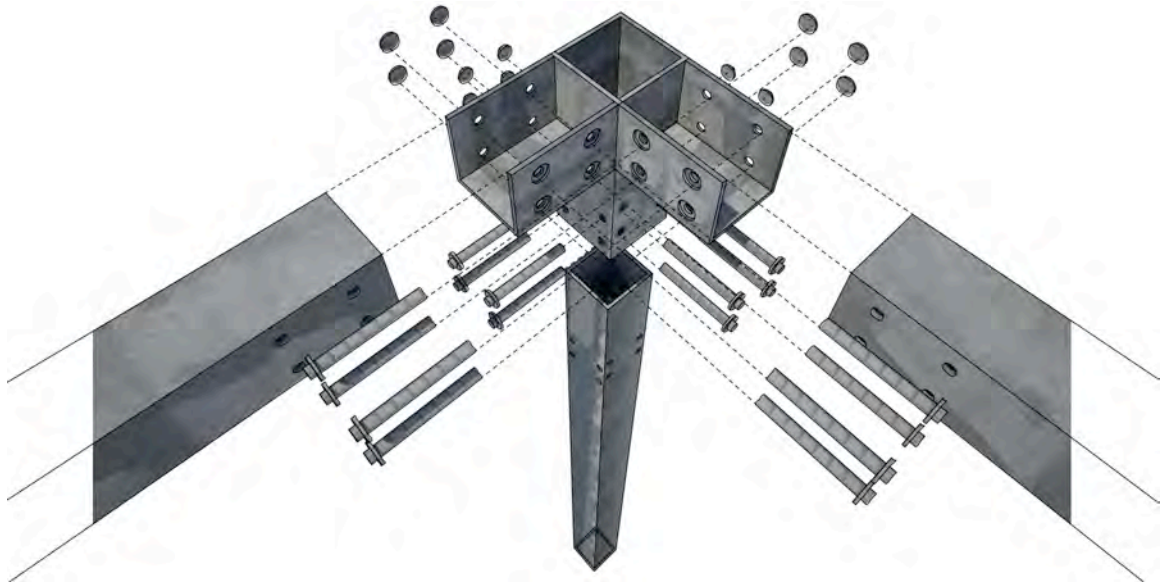


Figure 49 – Bolted Steel Connection by Author.

3.3.2 Designing for Deconstruction

Designing for deconstruction ensures that changing needs of future residents do not lead to demolishing buildings and contribution to landfills. Simi Valley has endured significant expansion in the last century, and to not expect or plan for future growth is simply not sustainable. In the case of this proposed housing system, simple changes like bolted and screwed connections, which can eventually be disassembled, and expandable housing plans that accept growth without creating barriers to it, can serve the needs of residents much better than traditional suburban developments. SIP panels without adhesives provide another element that can be deconstructed and re-used or sold in the

future. Figure 50 shows potential SIP panel layout, although basically any configuration is possible.



Figure 50 – SIP Panel Layouts by Author.

The proposed housing system will use SIP panels for wall, floor, and roof assemblies. Another benefit of SIP's is their high thermal value and thermal break, providing a more efficient wall envelope than many traditional framing methods. Figure 51 shows the relationship of different building components in an exploded axonometric drawing.

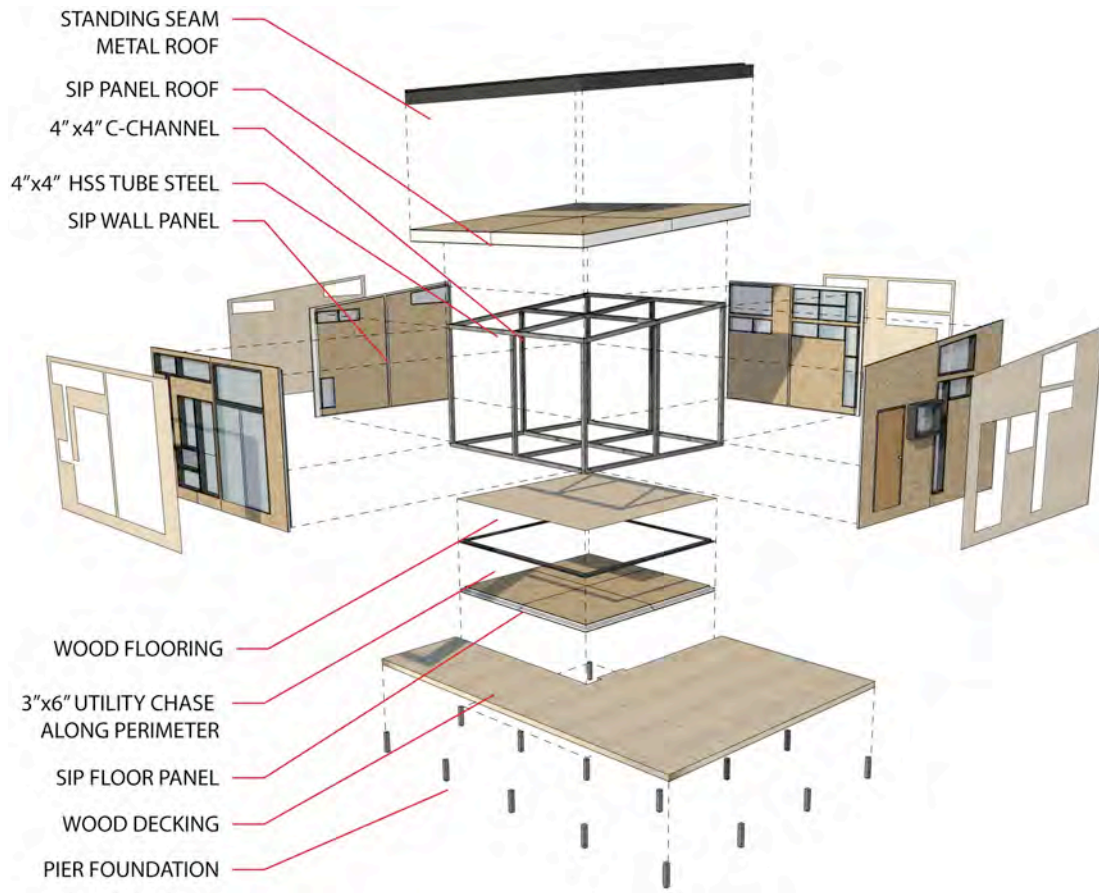


Figure 51 – Exploded Axonometric by Author.

One important aspect of flexibility, with regard to this project, is that the house should be able to decrease in size in the future. Families do not only grow in size; they also reduce in size from a variety of reasons. The ability to decrease the size of one's home is paramount to the success of a flexible housing system. It is doubly important to the City of Simi Valley since much of its aging population is looking for smaller homes. At the other end of the scale is a younger generation that is largely leaving Simi Valley because there are very little smaller detached houses in Simi Valley. The ability of a house to mirror the evolution of a family and change based on its needs/wants/financial abilities can also increase the duration a particular homeowner stays in a particular home, which has a variety of positive traits.

Traditional foundation systems in Southern California are often slab-on-grade. These systems are cheap and simple, but they do have a lasting presence that is generally only expandable in a larger direction, not able to be easily decreased in size. Pier foundation systems, contrastingly, sit lightly on their site and are easily excavated and reused at another site. This level of impermanence, compared to slab on grade systems, and the simple expandability of a pier system to provide more floor area, correlates well with the intent of deconstruction. Pier foundations also create opportunities for passive ventilation techniques that will be discussed in further detail later. Utility chases are carved along the corners of the floor SIP's, defining a 4" deep chase to run electrical and plumbing. Where the steel frame faces the interior of the house, tube-steel will be exchanged for C-channel with the opening facing inward to create a vertical utility chase that the floor chase will couple with to provide utilities to different spaces. Typical chases in SIP panels located near bathrooms or kitchens can be cut in the factory, and provide easy access for electrical and plumbing to extend from the C-channel chases.

3.3.3 Plan Layout

The layout of the proposed housing system has a simple back-to-front approach, taking influence from both Eichler Homes and Radburn. The "back" actually abuts the street, and is programmatically more private. The "front" opens to the interior green space, and is programmed as more public space in the house. The housing unit begins as a 16' x 16' compact one bedroom space, with a kitchen, bathroom and small living room. Sliding glass doors and a wraparound deck enhance indoor-outdoor connections and provide additional living area. Still, this unit is small and is intended to stand as a "suburban" alternative to multi-family housing. Simi Valley's housing base does not contain significant multi-family housing and has even less detached 1 bedroom units, nor

does it offer many affordable units. The deck sits on piers which, when needed, can serve as a foundation for an enclosed floor system, when the size of the house increases. The deck and siding on the house are the same material, and when the deck is replaced with conditioned livable space that deck material can change to exterior siding.

This 16' x 16' unit is intended to be able to transform into a larger residence in the future. For this reason the kitchen and bathrooms are located along the eastern wall of the house, which needs less sunlight infiltration and stands as an exterior wall for the adjacent house, given the zero-lot line approach to defining outdoor space(s). A simple addition of another 16' x 16' unit can add bedroom space and increase the living area. Another 16' x 16' addition creates additional bedroom space, an office, and semi-private outdoor space. An additional 16' x 16' space added next to the living area creates additional living and dining space, and further defines an exterior atrium that multiple spaces in the house open onto. Of course, this is one iteration of the possible evolution of a home, but multiple configurations can be realized since the building components are designed to be deconstructed and re-used in the future. Figure 52 demonstrates the potential evolution of a housing layout.

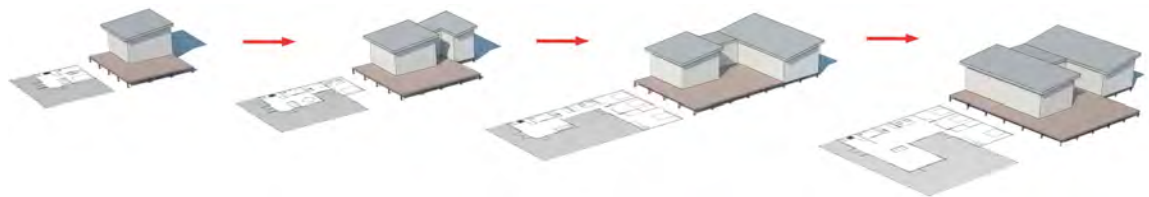


Figure 52 – Evolution of Housing System by Author.

Figures 53, 54, 55, and 56 show plans and sections for the same 4 layouts.

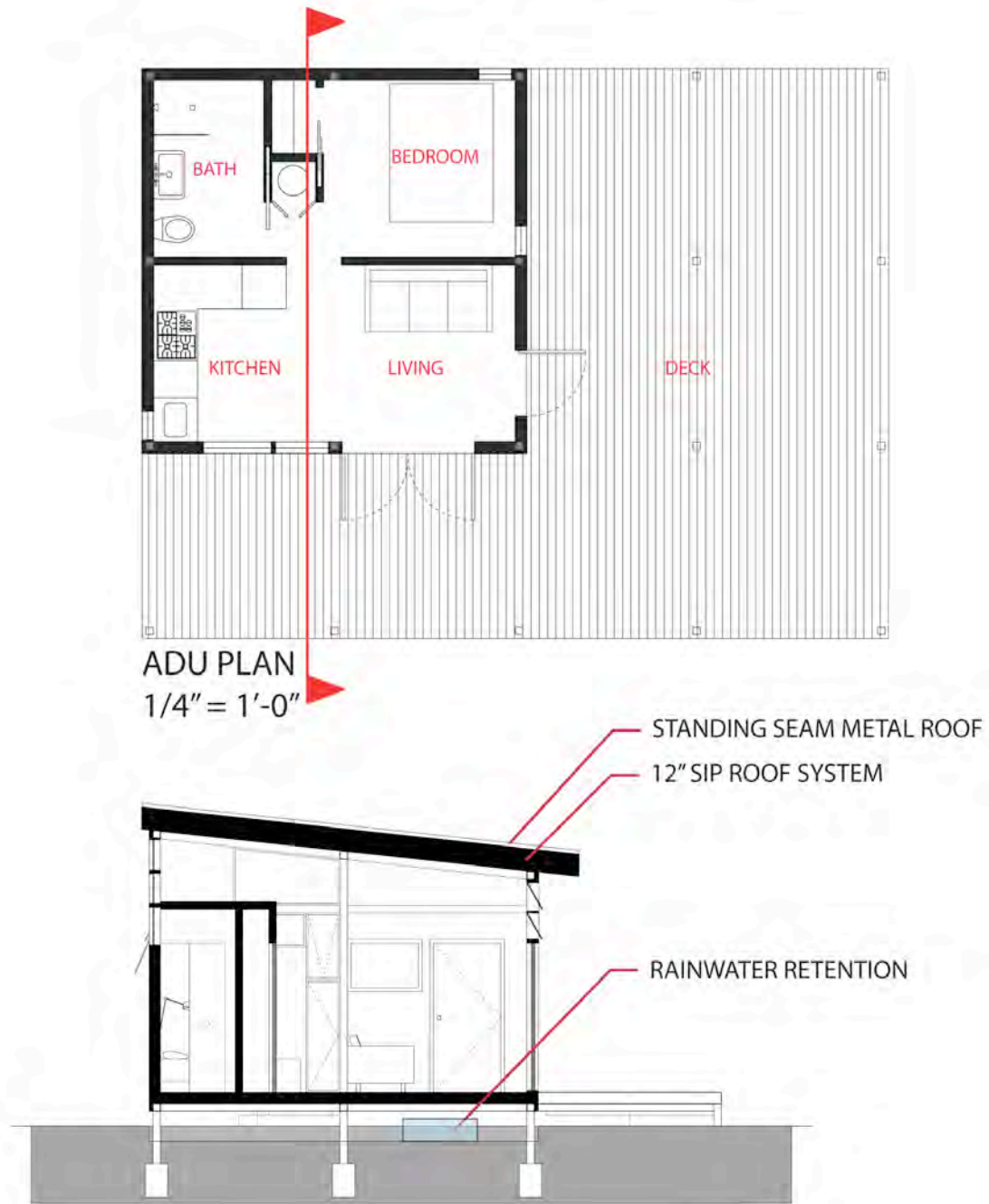


Figure 53 – Plan + Section for 16x16 Unit by Author.

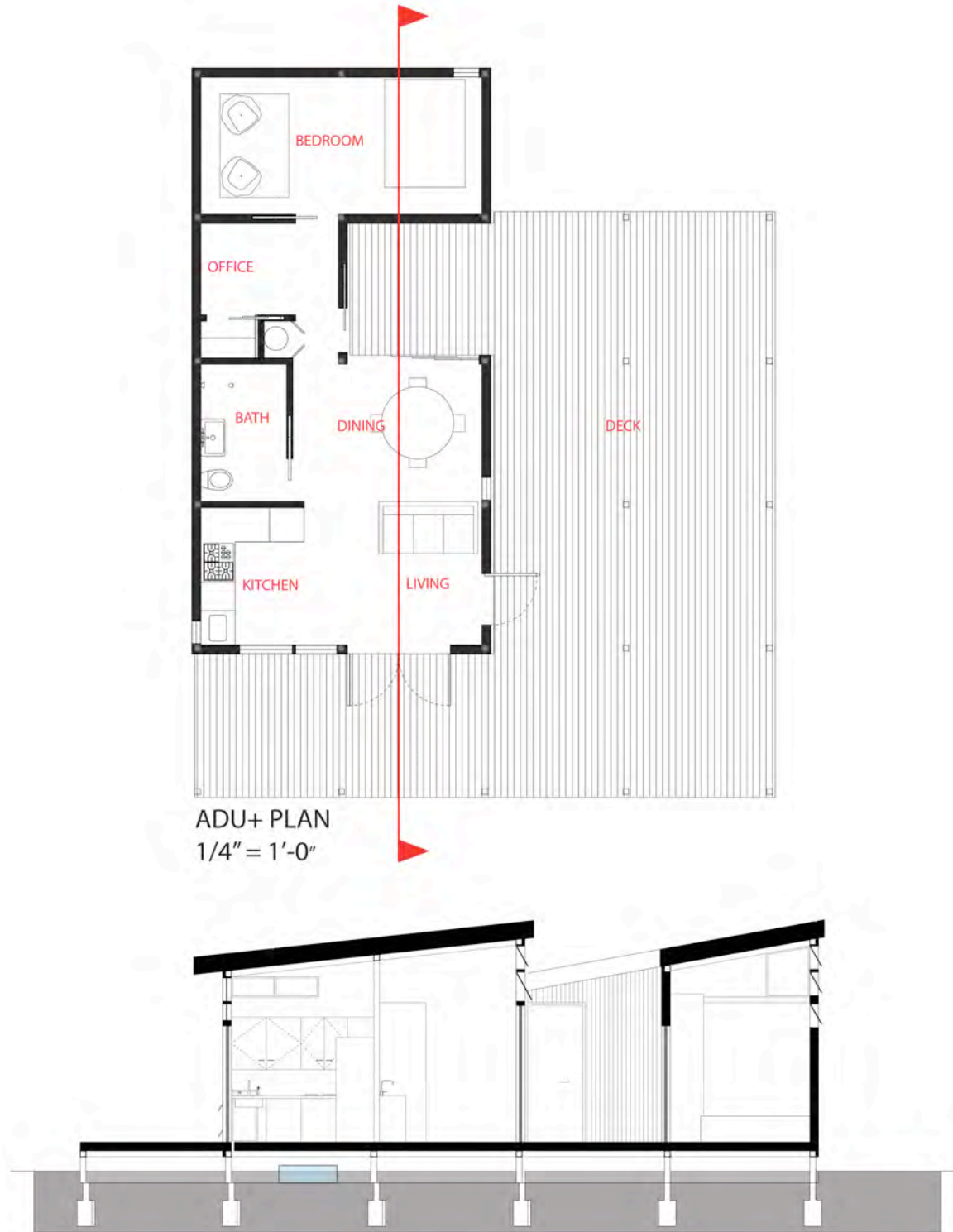


Figure 54 – Plan + Section for 16x32 Unit by Author.



L-UNIT PLAN
 1/4" = 1'-0"

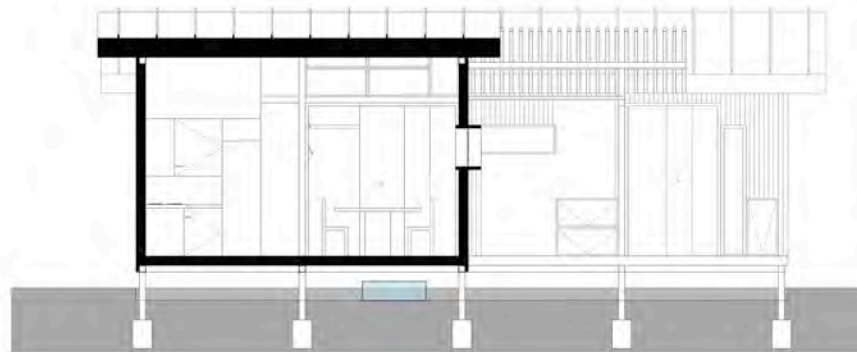


Figure 55 – Plan + Section for L Unit by Author.



U-UNIT PLAN
1/4" = 1'-0"

Figure 56 – Plan for U Unit by Author.

Located under the floor system is a rainwater retention container, which will aid in reducing water consumption in an area that receives very little rainfall and imports the majority of its water. An additional greywater re-use system will help water the landscaping, which is drought tolerant. The decks also have a trellis patio covering that allows for a degree of shade in the summer. Figure 57, 58, and 59 show renderings for each layout.



Figure 57 – 16x16 Unit Rendering by Author.



Figure 58 – 16x32 Unit Rendering by Author.



Figure 59 – L Unit Rendering by Author.



Figure 60 – U Unit Rendering by Author.

The proposed units will fit into an existing landscape of spread out ranch-style residences that are typically one-story. Two-story homes are occasionally integrated into the community as well, though they are often newer than the majority of the existing

homes. Stucco is the popular exterior finish, which differs somewhat from the proposed wood exterior. The building heights and scales integrate well into the existing context and do not overpower the existing residences. Figures 61, 62, and 63 show proposed residences in the context of their neighborhoods.

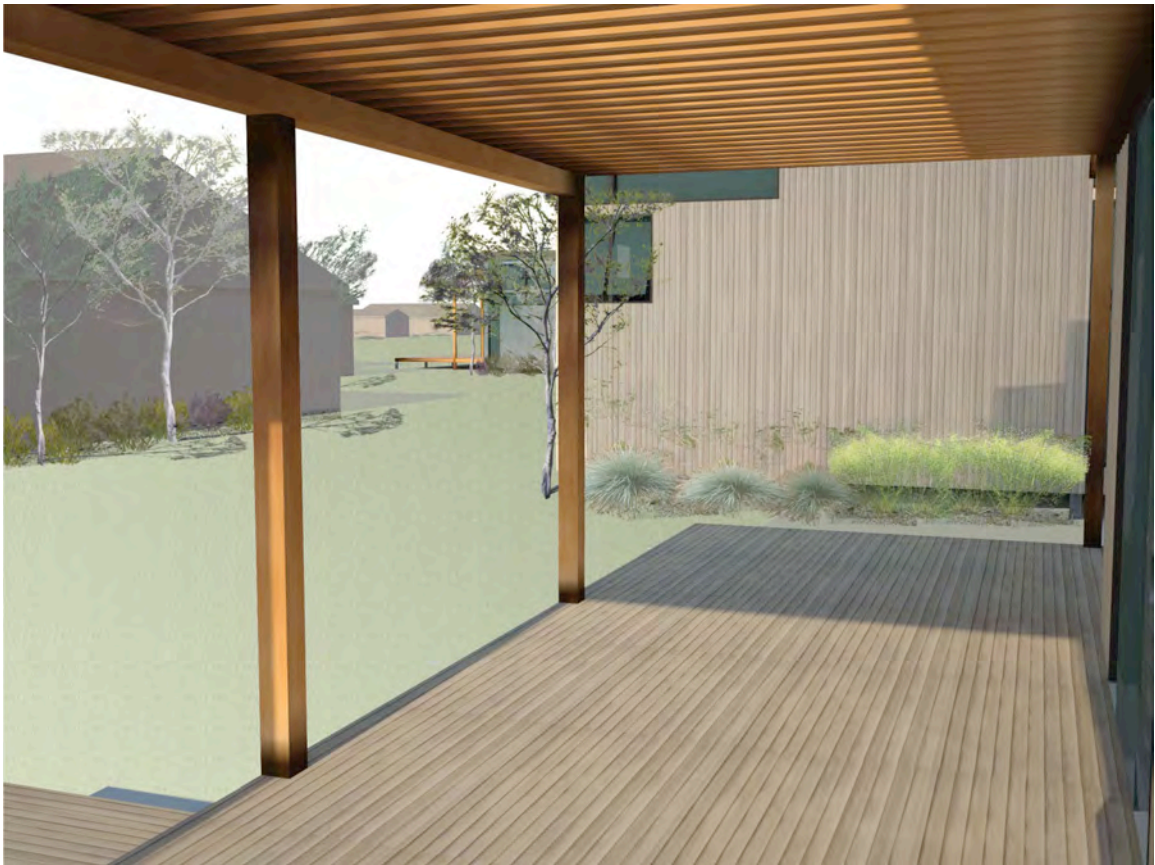


Figure 61 – Porch Rendering by Author.



**Figure 62 - Elevation
By Author.**



**Figure 63 - Context
Rendering by Author.**

3.3.4 Environmental Considerations

The proposed infill units give significant consideration to environmental aspects of design, including passive ventilation and daylighting, water re-use and retention, construction waste generation and deconstruction, and drought tolerant landscaping. Paving is minimized in order to encourage pervious surfaces that replenish the local aquifer and place less load on municipal storm water systems. Passive ventilation considerations were largely determined by prevailing wind direction during the cooling months, which is predominantly from the Southwest. Locating operable windows low on the Southwestern side of the building and high on the Northeastern side of the building encourage passive cooling and heat exfiltration. Daylighting considerations were driven by Ecotect, which provides site-specific data and visual daylighting analysis tools. Figure 64 shows prevailing wind direction by month and Figure 65 shows Ecotect analyses.



Figure 62 –Prevailing Wind Direction May – September from www.windfinder.com.

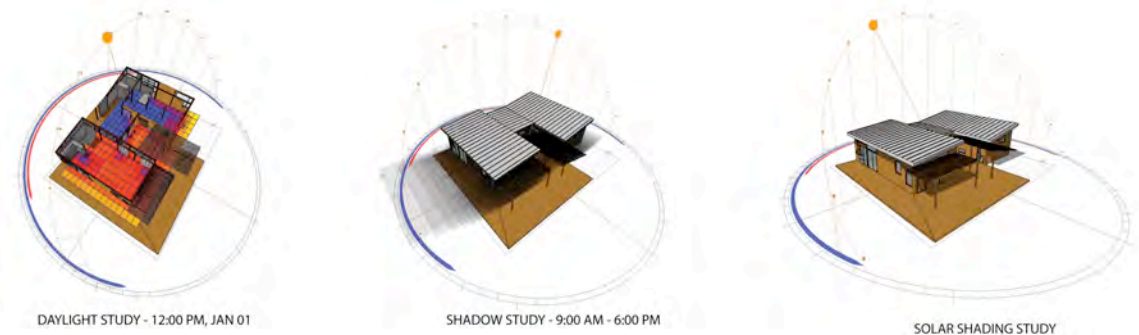


Figure 63 – Ecotect Analysis by Author.

This housing system is designed to change over time and with the transformations that occupants go through. It also serves to expand the narrow housing base to appeal to a greater variety of residents. Introducing zoning amendments to allow multiple accessory dwelling units, and eventually primary residences, on a single lot creates opportunities for rental and sales income. In terms of land allocation, easements, and unit access, the block will have to adopt a land "bank" distribution, where land is collectively gathered and redistributed according to building footprint and future expansion value. A certain amount of each lot would be donated to the city in exchange for the development and upkeep of the interior green space(s). Occasional access easements would provide public access to the interior of the block, although it would remain considerably hidden to encourage a sense of ownership amongst community residents. Environmental considerations play a large part in the design choices of this proposal and certainly in the site plan.

APPENDIX: PRESENTATION BOARDS

Re-designing Suburbia

Establishing a new infill development model for existing residential communities



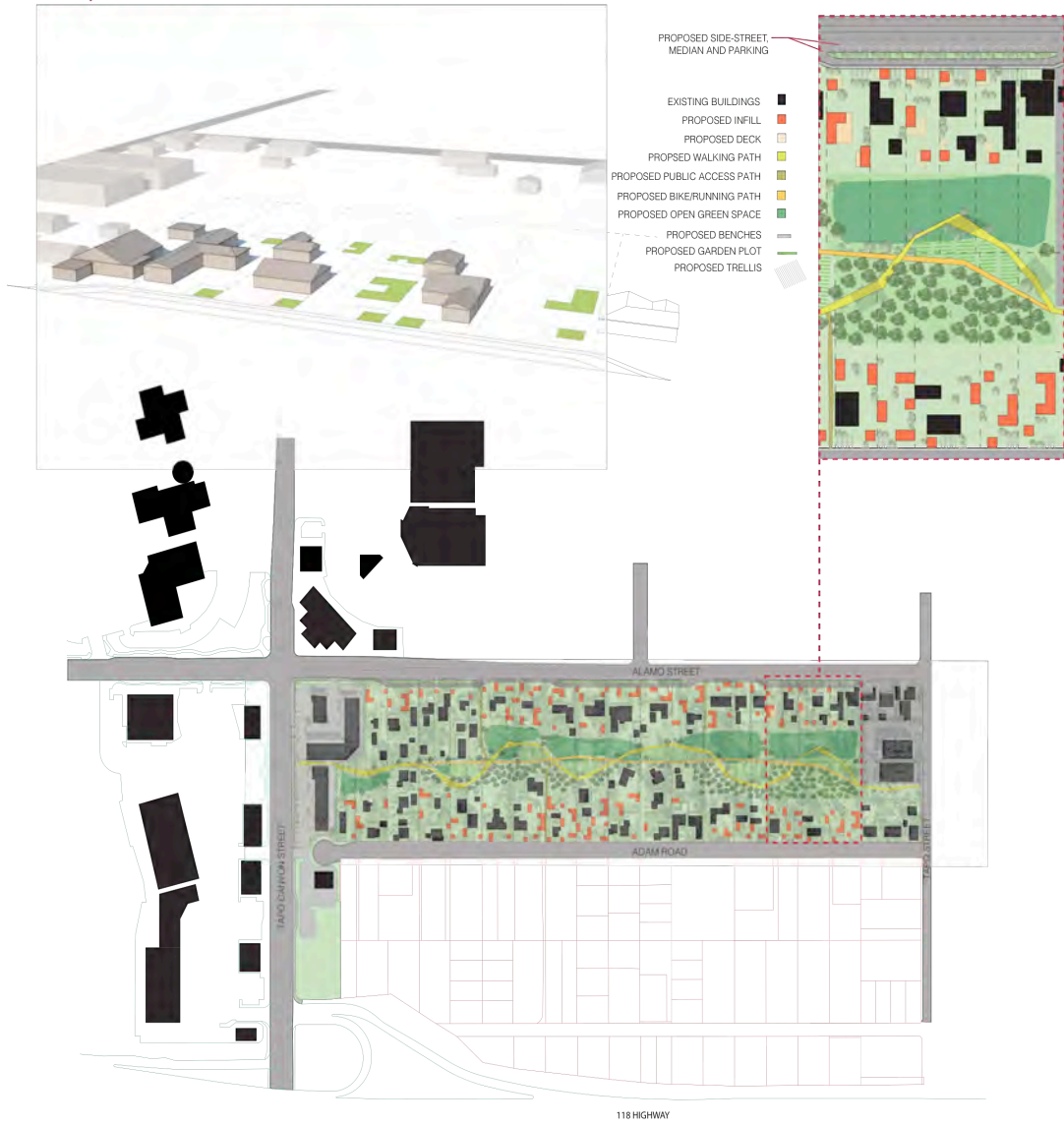
This thesis aims to design a framework to be used in the redevelopment of existing suburban communities. Using an existing low-density suburban community in Simi Valley, CA, as a site, I have explored compact infill housing as a method of densifying the neighborhood and broadening the housing base. Prefabrication ensures minimal system and deconstructable building components allow a flexible housing system that can adapt to mimic the evolution of a family. Accessible open space serves to draw the community together and provide usable outdoor spaces. In this way the suburban community can begin to operate in a more efficient manner and adequately address the needs of a broader range of residents.



Existing Site Plan



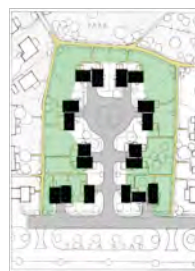
Proposed Site Plan + Infill



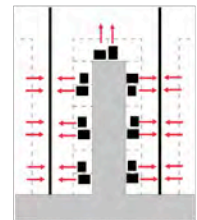
Levittown - Nassau County, NY



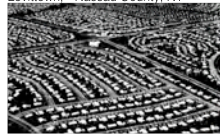
Eichler Homes - CA



Radburn - Fair Lawn, NJ

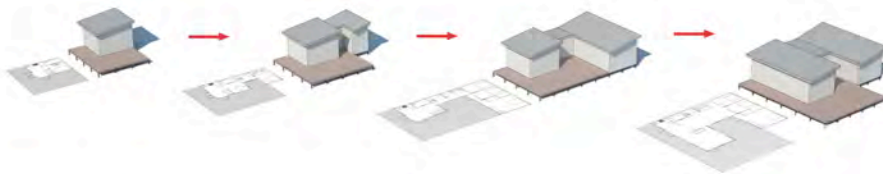
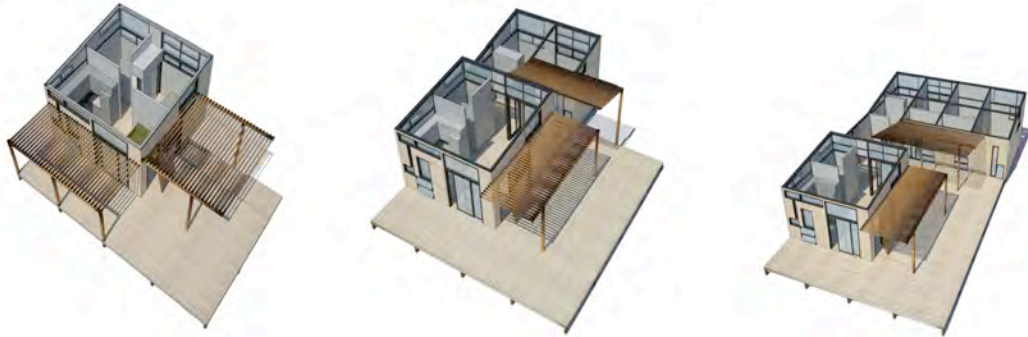


Introversion of block



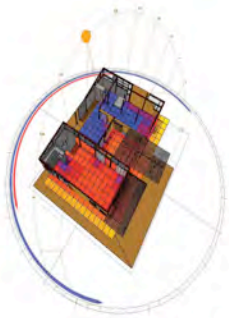
Village Homes - Davis, CA

Floor Plans

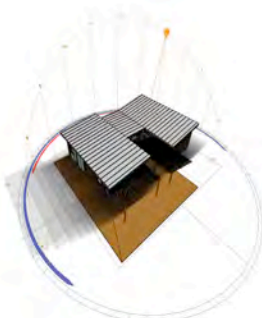


STREET ELEVATION

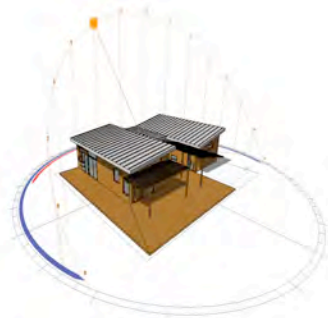
Daylighting



DAYLIGHT STUDY - 12:00 PM, JAN 01



SHADOW STUDY - 9:00 AM - 6:00 PM

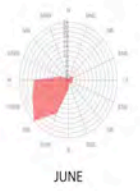


SOLAR SHADING STUDY

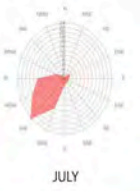
Prevailing Winds



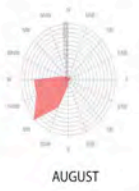
MAY



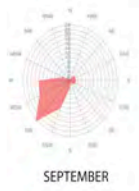
JUNE



JULY

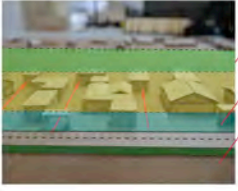


AUGUST



SEPTEMBER

DAYLIGHTING AND PASSIVE VENTILATION ARE IMPORTANT CONSIDERATIONS IN THE DRY ARID CLIMATE OF SOUTHERN CALIFORNIA. AMPLE SHADE IS PROVIDED DURING THE SUMMER MONTHS BY LARGE ROOF OVERHANGS AND TRELIS PATIOS. INCORPORATING PASSIVE VENTILATION TECHNIQUES ALSO HELPS DIMINISH THE IMPACT OF A HOT SUMMER SUN.

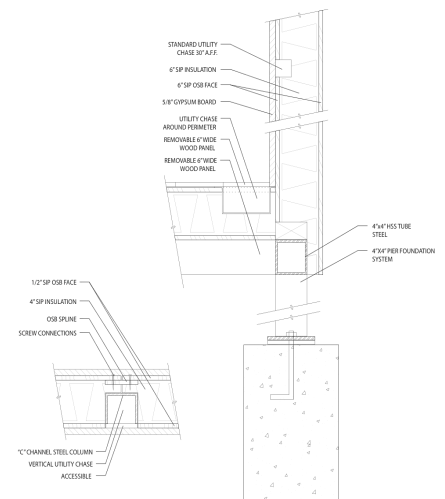
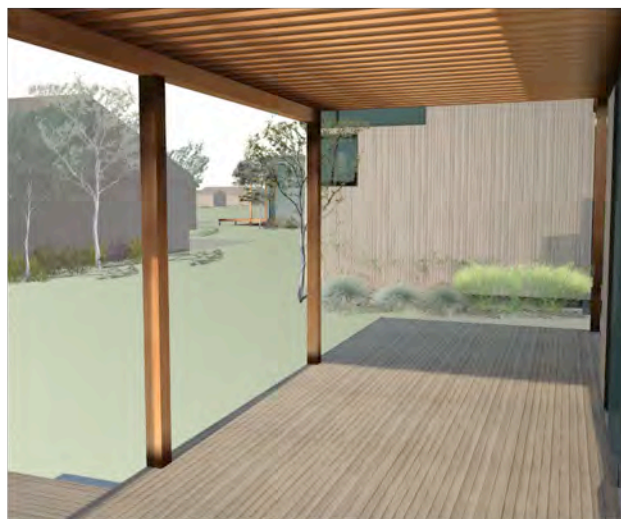
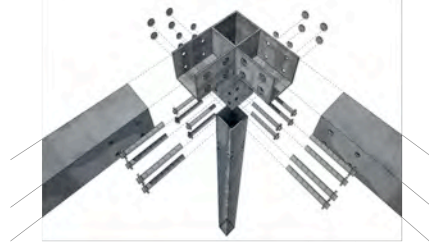
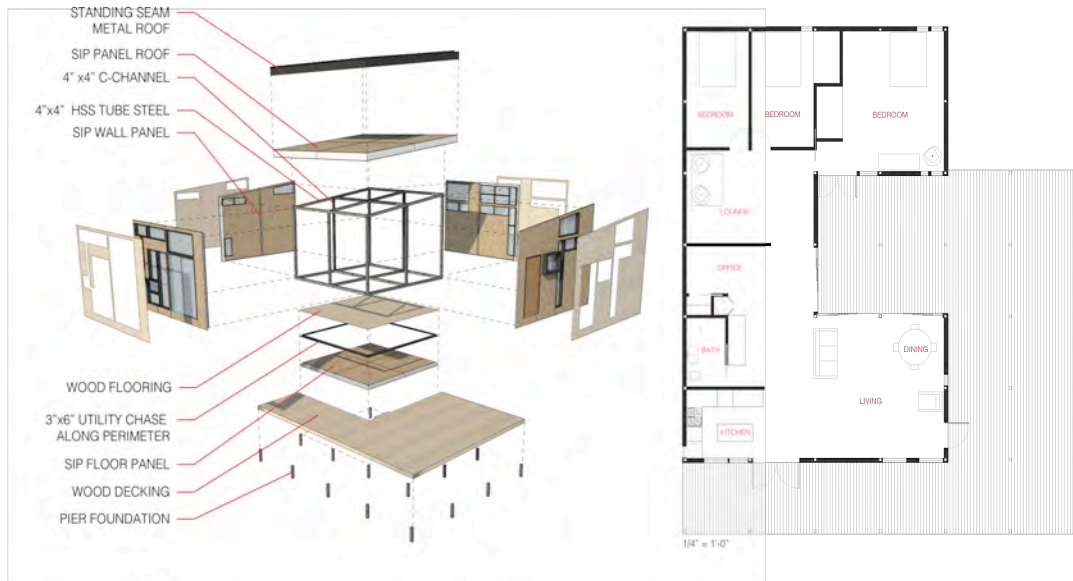


- OPEN GREEN SPACE ZONE
- LIVING ZONE
- LIVING + SERVICE ZONE



SIP Panels





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