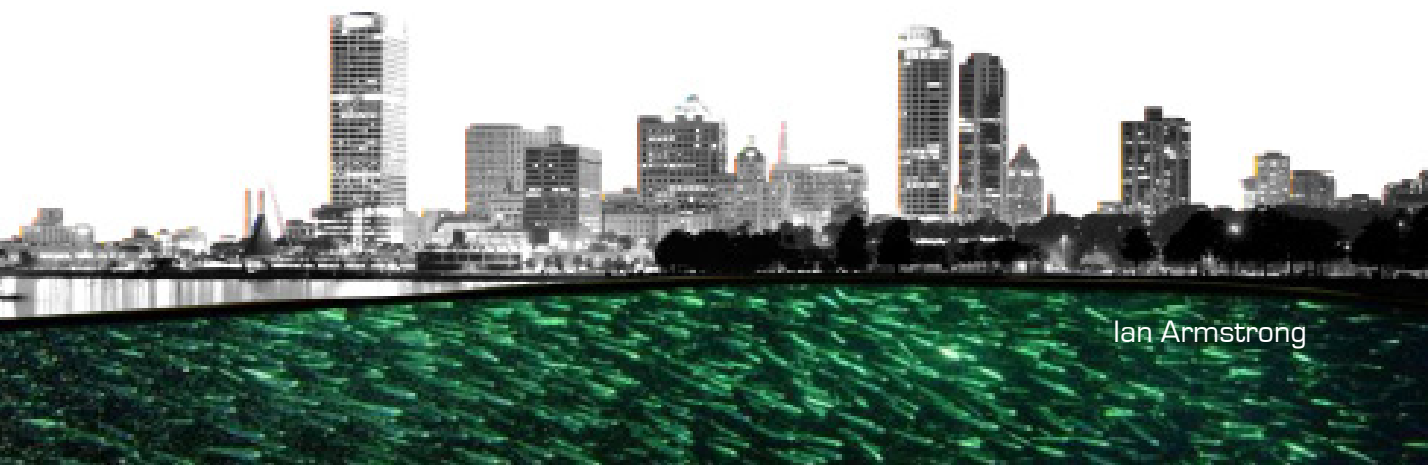


Living Enriched

Multi-Unit Flat Development with
Aquaponic System Integration



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“Contrary to what we read, sustainability is not about the triple bottom line, which uses the terminology of an accounting balance sheet and implies that we are merely statistics. It is more about combining the poetic and the material, the qualitative and the quantitative, the imaginative and the functional to create a quality environment for us now and in the future. And it is perhaps best represented by a rich tapestry that weaves strands from our major elements: design (aesthetics, architecture, a sense of place...), environmental concerns, economics and consideration for the individual and society. **Ultimately, it is the quality of individual lives that counts, we need to try to re-situate ourselves in (what remains of) the natural environment.”**

- Randall Thomas, Max
Fordham LLP

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abstract



Living Enriched is an architectural thesis that explores how we might provide personal green space to residents of dense urban centers. The project explores, more specifically, the development of a residential flat development with a system of generous balconies and integrated aquaponic systems.

Motivation for the project came from two initial thoughts. The first was an idea to see what it might be like to be able to provide green space to residents of cities outside of the usual public spaces. The second idea questioned whether or not these usual public spaces were really urban in nature or whether they actually became plots of rural space within a larger urban fabric. Through research and concept development, I have come to a design which, I believe, begins to challenge the issue of the urban disconnect with the natural environment.

This project attempts to blend the benefits of contact with the natural environment with the situation of city living through an architecture that makes this concept a reality. Above all, this project strives to create a circumstance that enhances the quality of life of its residents by providing a situation rethinks the way that we traditionally live on cities. It is about capturing the little moments; like watching the sunset from your balcony or picking fresh tomatoes off the vine for the evening meal. This project was reasonably composed with the thought that we might be able to enhance the way that we live in cities through something as simple as allowing the natural back in.

thesis introduction

Living Enriched: Multi-Unit Residential Development with Aquaponic System Integration

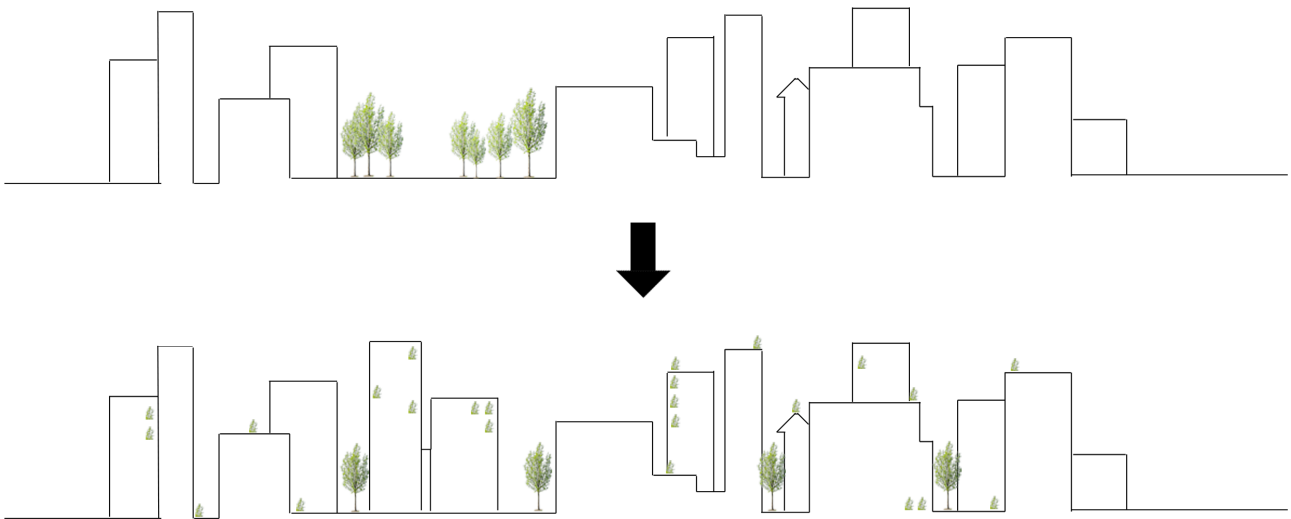
When one thinks about city living, one might envision busy streets, skyscrapers and the glow of lights throughout the night. What might not come to mind are tranquil getaways or fields of crops at harvest. The city has certain inherent qualities that make it a place for culture, art, business and commerce; qualities that lend themselves to a fast paced lifestyle. City life has become such a nostalgic way of living for many people because these qualities make for a great atmosphere to live, work and play. The qualities that is often missed however have to do with opportunities for natural exposure and relaxation. These qualities come to mind more easily when envisioning a more rural way of life that is based in wholesome work and a natural atmosphere. As this thesis began, I became increasingly interested in how we live in cities and why it is that the more tranquil traits of rural life are lost in city culture. Through much research and investigation, this thesis has evolved into a pointed look at how natural systems, specifically aquaponics, can affect the city living condition to improve ones quality of life. The idea for this thesis came about as a final iteration of my explorations on a couple of initial ideas.

The first idea that I had about city living was the concept that everyone in an entire city could have access to their own outdoor space. In the concept, the city would become an even more complex mesh of circulation arteries,

Incorporated into the usual city fabric would be an added layer of green that allows the individual the opportunity to be exposed to the luxury of outdoors within the comfort of their private living space. This idea came from my assumption that some people in cities do not have adequate access to personal or even public green space. Yet, cities need community green space for the good and wellbeing of their people. The American Planning Association states in their “Four Keys to Use Parks to Create Safer Neighborhoods,” that parks contribute to the overall wellbeing of their communities when “positively incorporated into a communities design.” [1] Yet even where adequate outdoor space is provided at the community level, personal space is often at a minimum. In urban centers, balconies are often small do not provide enough space to do anything more than lounging on a hot summers day.

The second thought that drove much of this thesis was the idea that an overgrown lot or community garden becomes a rural plot in the midst of an urban condition. More and more often we see city lots being transformed into gardens or fenced off to let Mother Nature do her work. Yet, these places are essentially foreign to the principle of the planned city. Here we see a rural condition thriving in an unc customary location. Often the gardens are a result of filling a public need or desire such as building a higher sense of community or because of a lack of fresh foods in the area. The idea prompts questions about what it means to be “urban” and how a place contributes the culture and vibrancy of its community?

[1] “How Cities Use Parks to Create Safer Neighborhoods.” How Cities Use Parks to Create Safer Neighborhoods. American Planning Association, n.d. Web. 10 Mar. 2013.



Through these ideas, I discovered that my thoughts were running from the city and the idea of urban. The ideas of adding outdoor space to the urban condition and of the foreign garden plot are each resolved in the countryside. In the country, these plots are not foreign and outdoor space is not planned and accounted for, but is a crucial part of the rural place. The concepts of city circulation, density and community that I have been fed as a student of architecture time and time again, were now a part of the issue. I saw the country farm as the solution to this issue. The farm was successful by its surplus of space and architecture built around the premise of outdoor living. At the farm, outdoor space was a necessary part of life, and so too was the personal relationship with the land itself. It was the counter-city and was an escape from the restricting factors and systems of cities.

Herein I found my project. While the farm is possibly the full opposite of the urban condition, it exposed an opportunity within the city for me with which to work. I began to realize that it was not the city that I was running from, but it was the parameters of city living that troubled me. It was apparent to me that working with in a dense urban context could be a factor that added to the strength of the project rather than a challenge shy away from. In a dense center, housing must be small, efficient and close to commodities and routes of circulation. Because housing must commonly be designed as such, green space becomes secondary to the urban needs of the individual. Green spaces are



Urban Landscape?



...or Rural Norm?

planned in large parks for recreation while the individual must trade private outdoor space for the public community of the city. Yet this way of life seems so different than the fields and woods that I had played in as a child. I hoped to find some way to rework them to the urban context. It was not the city that troubled me but the living circumstance that seemed to detach the individual from the natural environment. The question became: Can we design a living situation with the benefits of outdoor living and the natural environment for people who live in city centers?

Preliminary Research:

Through the course of history, agriculture has been pushed out to the edges of city because of its need for large amounts of space. This quality is not beneficial to the plan of a dense city and to the creation of walkable communities. As a result, we have the formation of a dense center where access to green spaces are minimal, and access to fresh foods comes as a result of the harvest on the peripheral. [2] This simple model can be easily understood as the way of America, as a part of our culture and in the contrast of a bustling city to a country farm. We see the cultural relevance of this dichotomy through our music and literature. We see musicians and poets write of their love and disdain for either the city or the country alike.

[2] Kostof, Spiro. *The City Shaped: Urban Patterns and Meanings through History*. Boston: Little, Brown, 1991. Print.

[3] Bryan, William Jennings. "Cross of Gold Speech." Democratic Convention. Illinois, Chicago. 8 July 1896. Speech.

William Jennings Bryan proclaimed his love for the rural plot when he proclaimed that if we "burn down your cities and leave our farms, your cities will spring up again as if by magic; but destroy our farms and grass will grow in the streets of every city in the country." [3] He illustrates one reality of our cultural situation. Without the production of foods in rural areas, our population could not survive. Yet, without the cities, we would lose the centers for art, commerce, music and business that are cornerstones of our culture.

Despite the separation, parks and community spaces are a crucial part of the urban fabric. These retreats have been deemed places that promote the recreation, health and overall wellbeing of our people. Current city trends show high numbers of people turning to urban farming and community gardens for their inherent positive effects. In fact, studies show that people who engage in creating their own working landscapes and food gardens benefit mentally, physically and emotionally. The North American Initiative on Urban Agriculture says that the experience of growing food is linked with its consumption, and that in an urban setting can promote healthy, safe and active communities. Gardening provides an opportunity for exercise and recreation, and improvements in both physical and mental health:

"Research that addresses gardening generally unveils the holistic advantages to gardening from exercise...working with plants in the outdoors benefits mental health, mental outlook and personal wellness of individuals. Cultivation activities trigger both illness prevention

and healing responses as we have seen their use in the world of health professions for patient intervention. Exposure has also been linked to inducing relaxation and to reduce fear, stress, anger, blood pressure and muscle tension.” [4]

Urban gardens have become a revival movement unto themselves as a way to revitalize communities and to utilize land that has become vacant land. Through these pop-up urban farms, communities have seen increases in wellness and healthy food consumption and education. [5] Some have begun too see these opportunities as economic springboards, such as Hantz farms in Detroit, MI. Hantz farms has a master plan to buy 1,500 parcels (roughly 140 acres of land) on the city’s east side for development as an urban farm for lumber as well as a variety of other traditional crops. [6] Yet, despite the success of urban gardens and farms in cities across the country, many question whether these gardens are merely a Band-Aid to larger problems of industrial downturn, inner city vacancy and food deserts, or are they a sustainable and long term solution? Can these farms be the missing factor into promoting healthy urban centers? These questions are linked to the thought that, in the midst of an economic boom, development will trump agriculture as space becomes a premium and these farms are cleared for development.

The question arises here too whether these farms in fact urban, or a slice of the countryside placed into an obscure situation? These questions of right of place or urbanity are for me a springboard to suggest; not that these

[4] Bellows, Anne C., PhD, Kathrine Brown, PhD, and Jac Smit, MCP. “Health Benefits of Urban Agriculture.” Community Food Security Coalition’s North American Initiative on Urban Agriculture (n.d.): n. pag. Web. 10 Oct. 2012.

[5] Whitesall, Amy. “American Gothic: Detroit Style.” American Gothic: Detroit Style. Michigan Today, 26 July 2012. Web. 10 Mar. 2013.

[6] Sands, David. “Hantz Farms Deal, Controversial Land Sale, To Go Before Detroit City Council.” The Huffington Post. TheHuffingtonPost.com, 19 Nov. 2012. Web. 13 Dec. 2012.

ideas are right or wrong, but that we might rethink how we will live with these working landscapes. What if Architecture could be designed to provide nature-human and outdoor-human relationships while integrating into the urban systems already in place? This could begin to give a higher sense of permanence to our interjection of productive landscapes within cities. The notion is that the introduction of “garden living” situations could work in conjunction with public green spaces to strengthen the natural aesthetic and framework of a city. These could remain urban by design and be permanent in that they would be an established part of the development of an area, based on the desire and opportunity to elevate one’s standard of life. These garden living apartments, in conjunction with public spaces could start to change the way that we live within cities by presenting the idea that the proven benefits of working landscapes could be directly applied to the places where we live.

Site (less) Basis:

In any healthy downtown there have a certain set of variable conditions. There is always, to some degree, a level of transportation infrastructure, whether by mass or public or personal. We have a population density that works to support some level of culture. We have a level of business and economic trade that allows for the particular level of

density to sustain existence. Finally, we have the intangible factor of place that includes the city plan, green space, architecture and overall feel of the place. Each city has a feel that is unique to its place, people, culture and that embodies everything down to the garbage in its streets. What if we changed the way that each member of this city's population lived by exposing each individual to a certain amount of personal outdoor space? What if every person had access to a place where they could not only grow fruits and vegetables, but to entertain, relax and eat?

As it stands, the living standard in most dense areas is the apartment complex. This creates a circumstance where single-family homes are not acceptable and where restaurants, bars and other businesses can be tightly squeezed onto a city block. This can result in a population that is upwards of two hundred people per block, and up to 400-450 people in places like New York City. [7] A standard apartment might have one or two bedrooms of roughly 120 square feet each with additional living, dining and kitchen spaces. More often than not, balconies where people can experience the outdoors, are not a part of the plan. Where balconies are included, they are generally small and provide little use for outdoor living. Reimagining this space with a large outdoor patio with potential to be a productive garden changes the whole aesthetic of the apartment. Outdoor access becomes a primary function and the interior can be simplified and minimized. A small efficient kitchen and bathroom paired with flowing spaces and minimal doorways would allow the interior to

[7] "City Population Density Statistics." Citypark-survey.org. The Trust For Public Land, 2011. Web. Nov.-Dec. 2012.

to begin to flow into the outdoor spaces. These spaces would provide an auxiliary living space and can add substantial square footage to a minimal interior space. We now consider a living situation that welcomes the use of the outdoors and promotes it through a design that allows the space to be comfortable, adaptable and convenient.

aquaponics

[8] "Backyard AquaponicsA Place to Discuss Aquaponics." Backyard Aquaponics • Water to Fish. N.p., 10 Jan. 2013. Web. 25 Apr. 2013.



Aquaponics:

Aquaponics is the name of the productive system that integrates aquaculture (fish farming) and hydroponics (water based plant farming). The system utilizes a cyclical water filtration system and a symbiotic relationship between plants and fish to produce at a high rate. The system is able to grow fish [about 1" of fish to 1 gallon of water] [8] given a relatively low amount of space. The system can be worked in a few different ways, but the basic system works as follows: Water in the fish tanks is circulated to plant beds where they filter the water and are fertilized by the excrement from the fish. The clean water is then circulated back into the fish tanks to provide a healthy living environment where the fish can grow. The system provides both a healthy living environment for the fish and a constant flow of fertilized water for the plant life. In this whole process the only continuous input is fish food.

There are three primary setups that can support this type of aquaponic system. The first is called the Deep Growth technique which floats a growing medium on top of the water in the fish tank. The plant life attach their roots to the media and draw water and nutrients directly from the water below. The next setup is called the Media Bed technique that places a media bed on top of a layer of pebbles and rocks. The water from the fish tank is pumped to the plants, which take in the water that they need. The excess trickles down through the pebbles and is then carried back into the fish tank as filtered water. The final system, and the system directly

applicable to this project, is the Nutrient Film technique. This setup utilizes a system of water-carrying pipes to irrigate the plant life. Plants are grown within small nutrient film “baskets” that rest within the pipes. These baskets created at increments along the length of the pipe to allow room for each plant to grow. In this setup, the water is filtered as it passes through the network of roots within the pipe that is formed as the plants grow. [9]

Each system can support a wide variety of fish species from goldfish to bluegill and tilapia and can be used for either entertainment or production purposes. Plant life is equally as flexible. Gardeners can plant anything from herbs and small vegetables to cucumbers and even squash in these aquaponic systems. The vast flexibility of these systems is one quality that makes them good system for a variety of users, from casual growers to production minded business people. Add to any of the above systems an adequate amount of light for the plant life to grow, and an aerator and thermostat to monitor the quality and temperature of the water, and you have yourself a fully operational aquaponic system. [10]

[9] “Growing Power.” Growing Power. N.p., 2 Jan. 2013. Web. 25 Apr. 2013.

[10] “Nelson & Pade.” Aquaponic Systems. N.p., 2 Jan. 2013. Web. 25 Apr. 2013.



Images of working aquaponics systems, courtesy of Growing Power, Milwaukee, WI



1 Nutrient Film

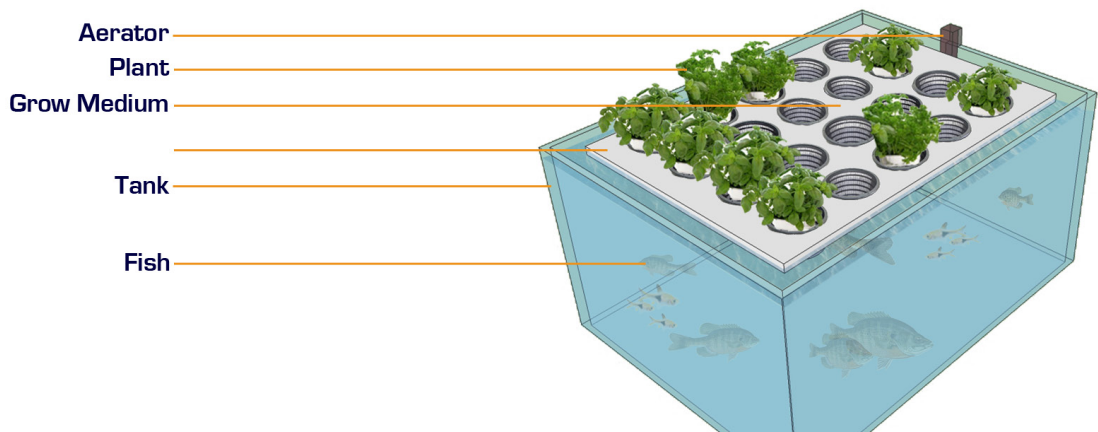
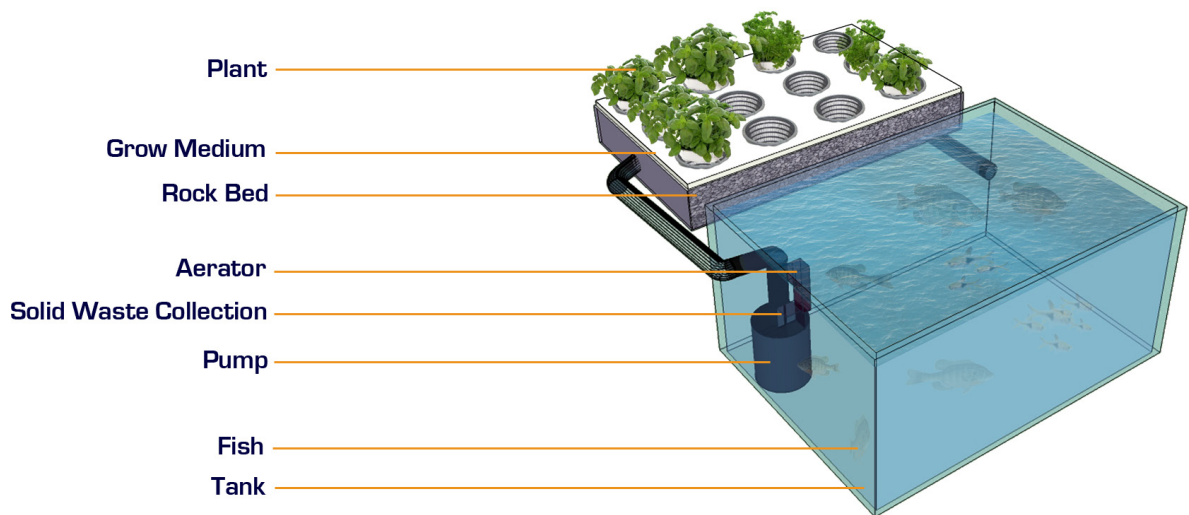
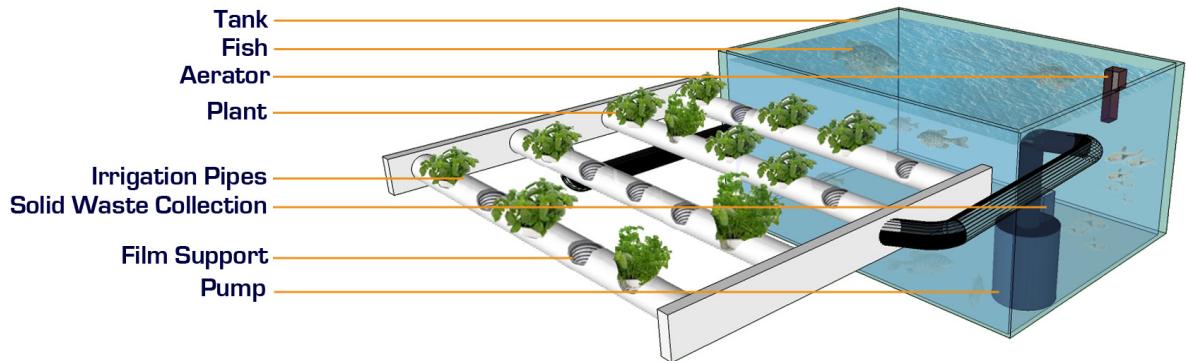
In this system, water is pumped through irrigation pipes that have built-in film baskets. In these baskets are planted the plant material. As fertilized water passes through the pipe, the plant is able to take in nutrients and water to grow. The roots of the plant secure it in place within the pipe and allow it to grow at a high rate until mature.

2 Media Bed

The Media Bed system utilizes a lightweight polystyrene bed with netted pots for plant growth, atop a thick layer of rocks and pebbles. Water is pumped from the fish tank to either from above or directly into the rock bed. The roots of the plant material secure themselves in the rock base and take in water and nutrients. The rocks help to filter the water as well and provide the fish with clean water in which to live.

3 Deep Growth/Raft

In the deep growth/raft system, a media bed is floated directly on top of the fish tank. The roots of the plants reach into the water for nutrition and plant themselves within the growing medium. In this system, more frequent cleaning is necessary due to bottom settling of waste, but the system can be efficient for small residential uses.



case studies

It was evident that a project of this type needed to look at a variety of different fields to draw from. I looked at projects ranging from permanent developments, to installations. I looked at architectural solutions that dealt with retro-fitting underutilized structures as well as examples of new construction. For this thesis, there were so many projects that could be deemed helpful. I tried to focus my efforts on evaluating projects that had: (A) a dichotomy between interior and exterior personal spaces, (B) productive landscape integration and (C) an urban or community living component. From each project shown here I gathered valuable information about how to represent each of these elements in my own design.

Projects to follow are:

Case Studies

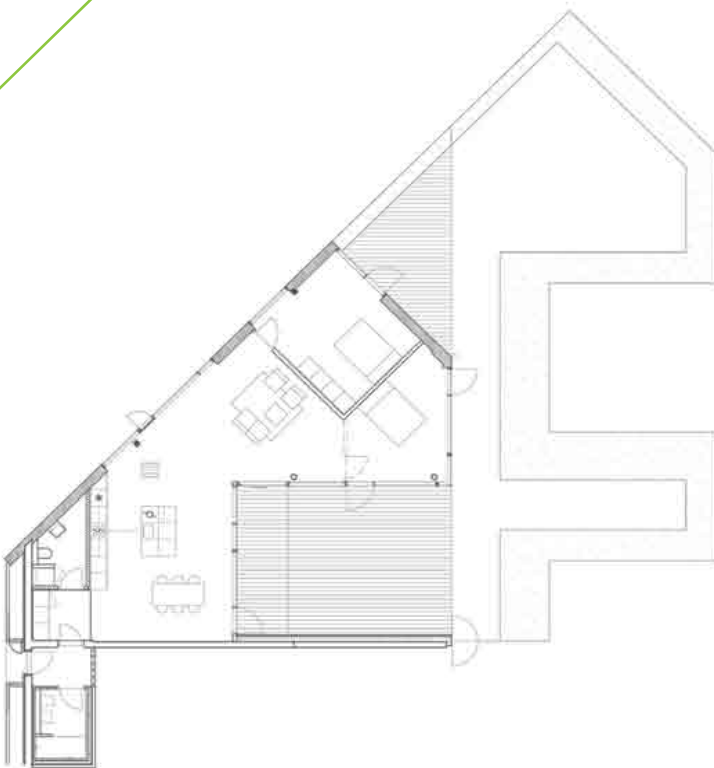
1. Mountain Dwellings, BIG Architecture
2. Pool Farm, Future Green Studio
3. Namba Parks, Jerde Partnership
4. P.F.1, WORK Arch. Co. & MOMA
5. Elwood Green Apts, Crosby Arch.

Counter-Studies

6. Pingree Farms, Detroit
7. Logemets Anglet, OFF Architecture



balcony reverse view



unit plan

01BIG

Mountain Dwellings

Bjarke Ingalles Group out of Copenhagen has been lauded as a design leader and innovator especially when it comes to the field of and sustainable thinking. Their project titled Mountain Dwellings shows a unique way of designing for outdoor use and comfort utilizing an untraditional form. The housing project sits on the edge of the city of Orestad, Denmark and allows views of the city on the sloped South and East facades. Rather than the units being stacked with outdoor balconies, the units are stepped back along the façade allowing the terrace of an upper unit to bear on the indoor space of the below. Garden planters are utilized outside of each unit as a means of providing a safety barrier as well as to separate units. Below this stepping of housing units is a multi-story parking garage that has direct access to the housing at every level. The creative form of the overall building is really the main element of the design. It provides both a functional and architectural feature that allows other aspects of the design to shine.

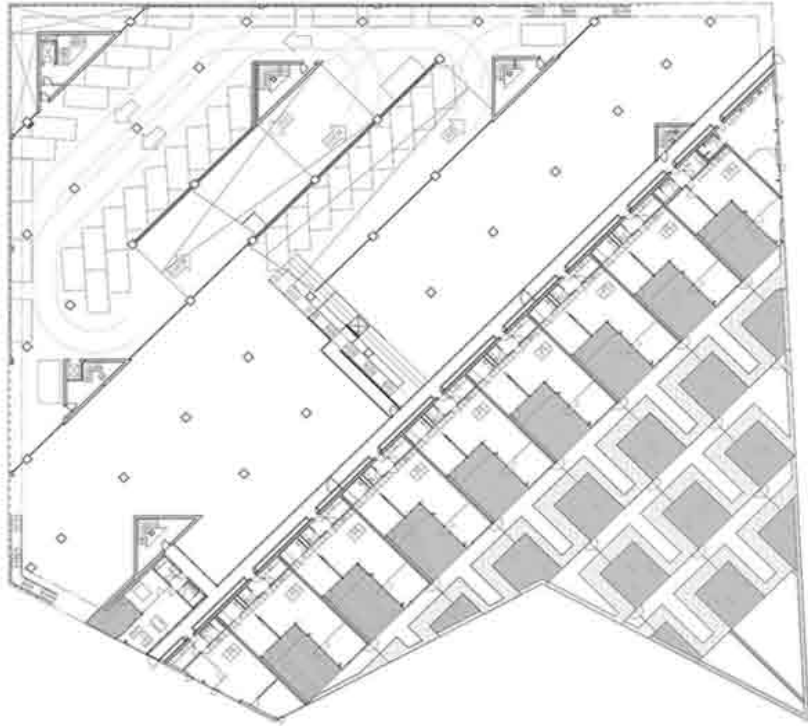
Of note for this thesis is also the design of the single unit plan. The exterior wall on the terrace side opens to the outdoors with sliding doors and allows light to pour into the unit through a mostly glass façade. This wall bends in and out creating smaller spaces that become comfortable and intimate. This helps to sculpt not only the outdoor gardens but the indoor



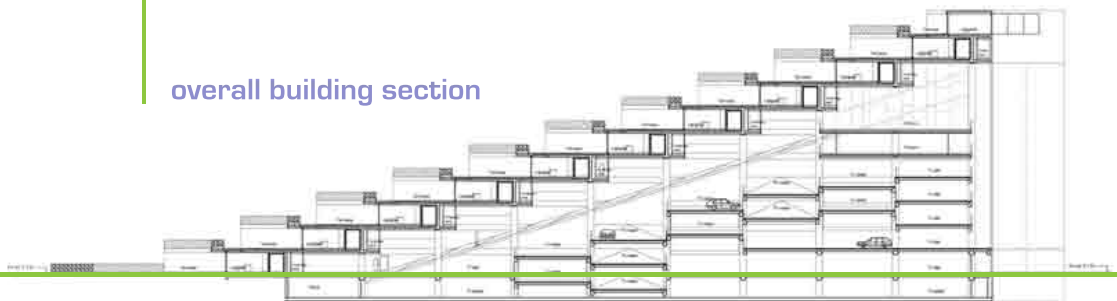
Also of note for this project is that community or shared spaces are minimally considered. Though the buildings aim was to provide great personal spaces for its inhabitants, public space seems to have been virtually ignored. The only real nod to this type of space can be seen best on the plan, at right, that shows an indentation in the side of the overall rectangular plan. This is a large un-programmed patio space that functions as the main pedestrian entrance to the building. [11]

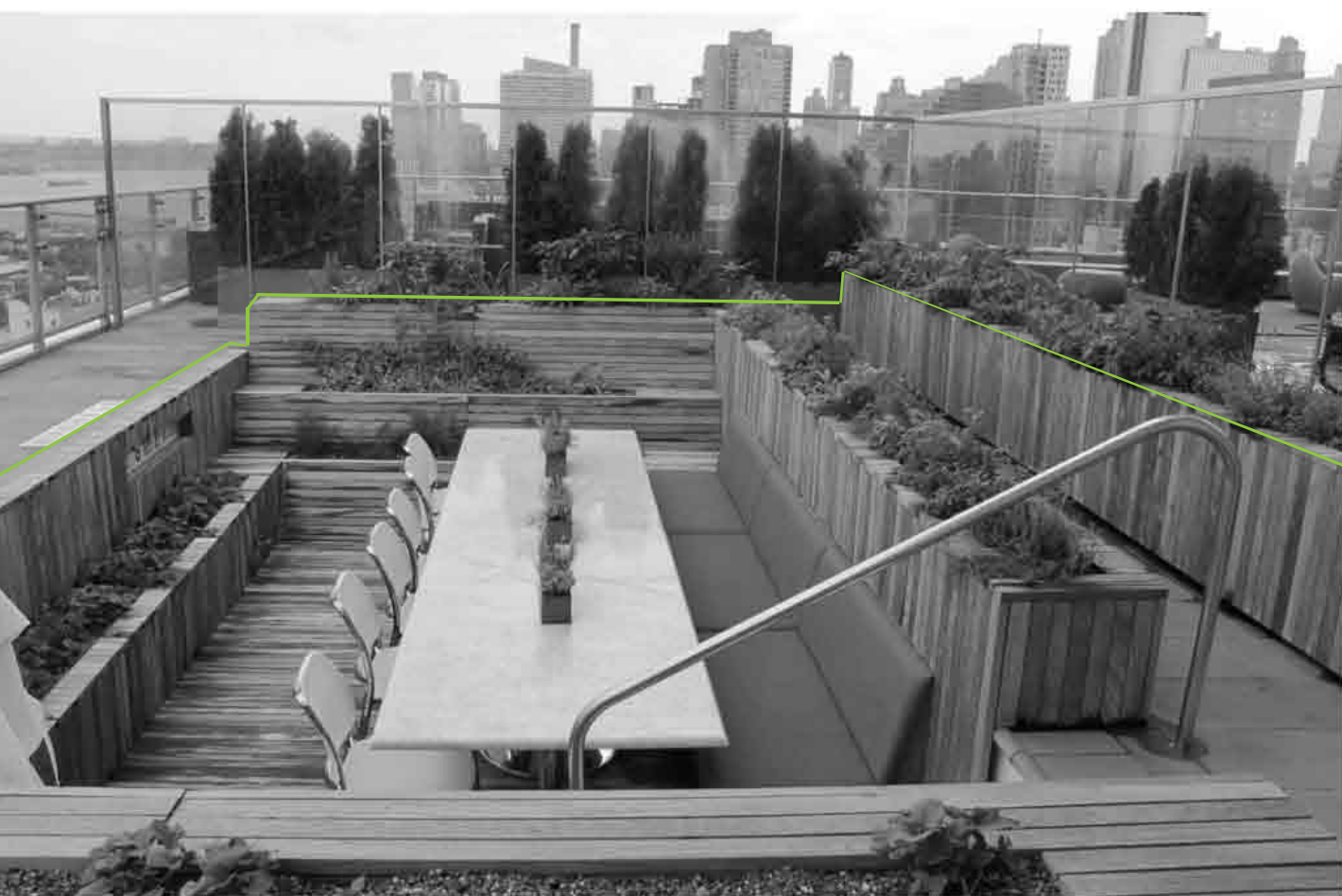
[11] Images and info courtesy of "Mountain Dwellings / BIG with JDS." ArchDaily. N.p., n.d. Web. 13 Dec. 2012.

4th floor plan



overall building section





02

Pool Farm

Future Green Studio

This project named Pool Farm by Future Green Studios is a retrofit of an old and underutilized rooftop pool and patio. The project in New York City was done to promote the high-end restaurant whose home is in the building below. Pool farm successfully turns a vacant rooftop pool into a garden, with restaurant seating in the midst. The development of the roof patio achieves multiple goals. The first is that it provides a location for the restaurant to grow herbs and vegetables. Providing some of their own foods on site allows them to market themselves as having a garden to plate philosophy. This enhances their perception with the public and adds to the quality of their dishes at the same time. The project also provides a unique dining experience that patrons would not get at other restaurants. How many other places can you see your food being picked and watered and then be able to indulge in these foods as a part of your dinner? In the evening, the patio is lit and customers enjoy great views of the city as well.

The pool farm uses, almost exclusively, aged wood planks that line the planters and sides of the pool and floor. This creates a flow where each element becomes similar to each of the others. This dulls the lines between pool, and garden and puts the user into a space that is active and experiential. [12]

[12] Images and Info courtesy of "Lessons From an Edible Garden on a City Roof." Houzz.com. N.p., n.d. Web. 14 Dec. 2012.



03 Namba Parks Jerde Partnership

Namba Parks by The Jerde Partnership in Osaka, Japan, is a statement for the identity of the city. At least, that is what it was meant to be as the firm was asked to create a “gateway to redefine Osaka’s identity.” The project shoots a large rooftop terrace garden into the dense steel, glass and concrete architecture of the city. Green space in Osaka is very limited, so this project provides more to the community than just a place to relax and walk around, but provides somewhat of an escape from the everyday. The terraces sit atop a modern shopping mall whose halls are often open to the sky above. Though the stores are all enclosed below the terraces, the paths of the mall curve and tangle in and out allowing one to wander between the stores and green terraces in somewhat of a maze. Though this could be confusing for some determined shoppers, the goal is to promote this wandering between spaces and to make the terraces places to stop and gather or dine in the comfort of a man-made nature. In the evening, the aesthetic increases as light filters out through slits in the building and lights the trees and patios. It further emphasizes the complexity of the plan. [13]

[13] Images and Info courtesy of “Namba Parks | ArchDaily.” Namba Parks | ArchDaily. Arch Daily, 5 Jan. 2013. Web. 25 Apr. 2013.



[14] Images and Info courtesy of Andraos, Amale, and Dan Wood. Above the Pavement – the Farm!: Architecture & Agriculture at P.F.1. New York: Princeton Architectural, 2010.

04

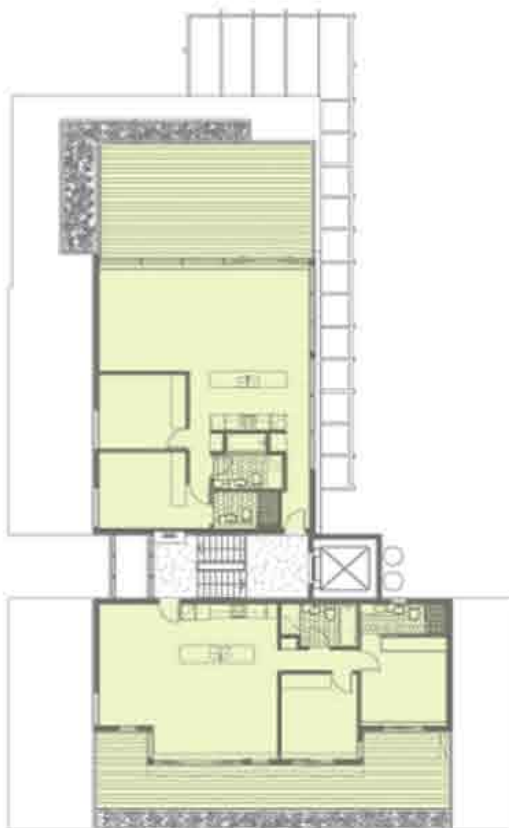
P.F.1

WORK Arch Co. & MOMA

The project titled P.F.1 by the WORK Architecture Company of New York and the Museum of Modern Art works to provide opportunities for the user. Using a system of elevated cardboard tubes, filled with a lightweight soil composite, the designers created an urban farm that activated a vacant, paved over city lot into what Fritz Haeg calls a “complex living situation, responding to the larger living situation of the city and the global networks that it exists within... The typical team that an architect is used to shepherding has for P.F.1, expanded to include an exciting breadth of human endeavors: the farmers and the engineers, the art curators and solar experts, the college students and experimental soil companies, the graphic designers and chicken handlers.” The roles of these individuals made the project very interesting as a study. It allowed the project to become something more than an installation and study on rethinking how an urban farm could be utilized. The success of this project relied heavily on the depth of the research performed and the way in which the details of the design were played out. For instance, although the farm was built with portions elevated in the air, the ground level served as an information portal. It brought interactive elements that allowed the systems being executed above the pavement, to be brought to those on the ground level. [14]



street view



3rd Floor Plan

05

Elwood Green Apts. Crosby Architects

This Elwood Green Apartments are a 25 unit apartment complex designed by Crosby Architects in Elwood, Australia. The apartments illustrate a similar scale and design intent as my project. The three-level complex, with basement parking access bunches living spaces into two wings which simplifies circulation and allows for generous outdoor spaces. Each resident also has access to a significant amount of outdoor space that, in most cases spans the entire length of one exterior wall. The project, similar to Mountain Dwellings, by BIG Architecture, steps back at each subsequent level so that the balconies of the level above rest on the interior space of the below.

The first level is eloquently designed to provide semi-private outdoor spaces for each apartment without obstructing the flow of occupants to their own units. As you move inside the apartments, you find a flowing plan that blurs the indoor and outdoor spaces with clever material use. The spaces feel larger than their square footages might suggest because of their simple and open layouts that minimize interior circulation loss. [15]

[15] Images and Info courtesy of "Elwood Green Apartments." Crosby Architects. N.p., n.d. Web. 4 Mar. 2013.

The indoor perspective shown at right shows design intent and the utilization of materials to bleed indoor and outdoor space. The space is light, modern and uncluttered, and invites you to enjoy the outdoor space.



street panorama



interior view

The street panorama at left shows how nicely the project integrates into the existing environment. Although the type is something very different than the surrounding context, it is able to successfully mesh with its surroundings. [15]

[15] Images and Info courtesy of "Elwood Green Apartments." Crosby Architects. N.p., n.d. Web. 4 Mar. 2013.

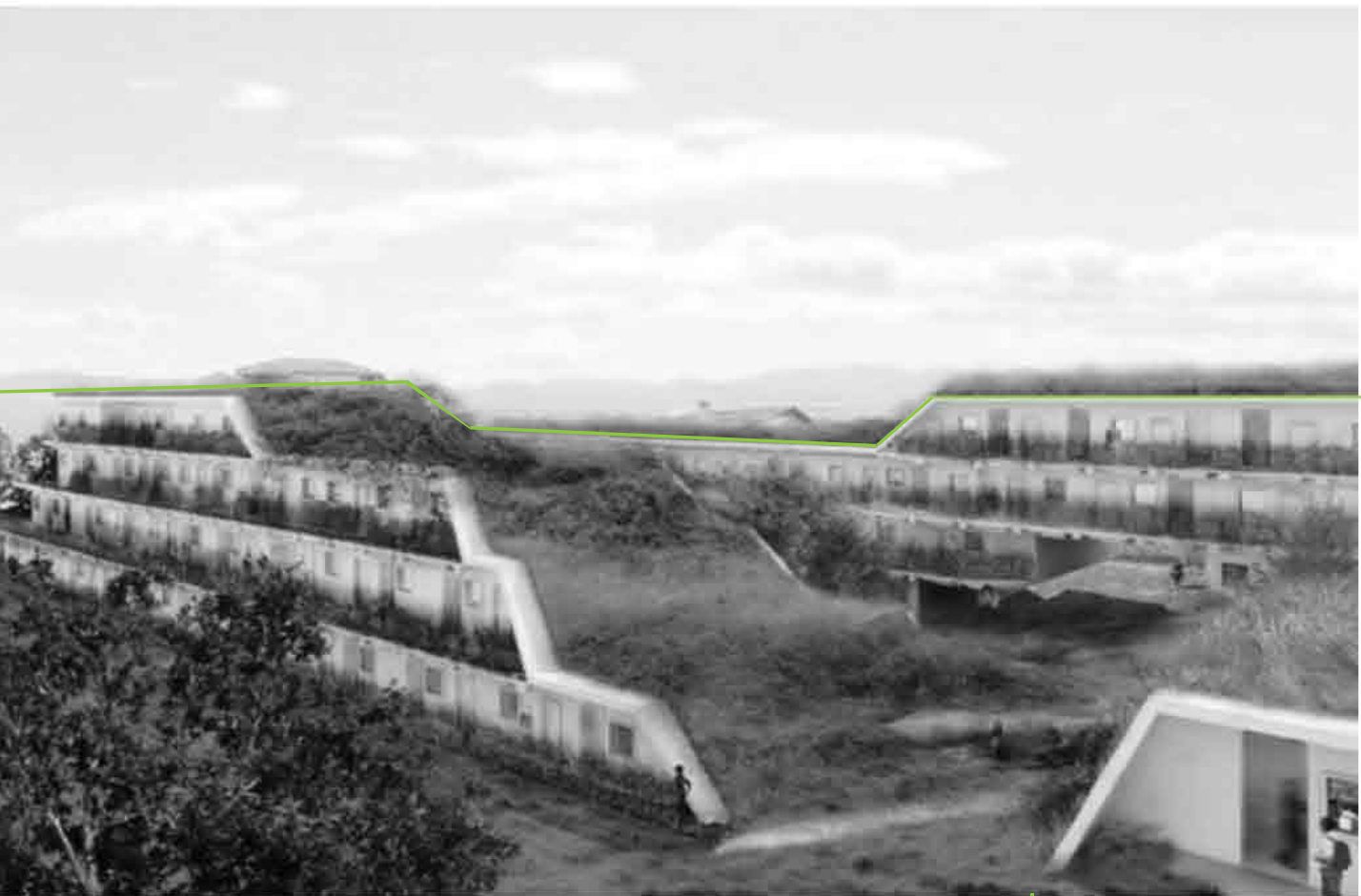


06

Pingree Farms Farm in Detroit, MI

Pingree Farms is an “urban” farm located at the intersection of 7 Mile and interstate 75 in Detroit, MI. The farm operates by the hard work of one hired farmer and some support help. The project covers 8 city blocks, grows over 30 different types of fruits and vegetables and plans to build barns for operations equipment. Yet this farm differs from the model of other urban farms in that it is funded by the manufacturing business next door. All capital needed for the farm is provided by this business and all of the farms harvest goes to those in need in the community. Neighbors are encouraged to go in and pick whatever they need for themselves and their family. The idea this farm could become a staple of the community where they might eventually take more ownership in the farm and help in its upkeep. The farm has also helped to lower crime rates in the area as well as overall wellness by demolishing countless abandoned and burned out homes that were previously on the property.

This project is severely detached from its site. There is nothing that really links this farm to its location or culture at this point. As one walks around the farm, even the noise of the highway and reality that you are within the heart of Detroit seem to be dulled out. In many ways the farm becomes a slice of rural America placed into the heart of the city. Is this a good thing?



perspective view

07

Logemets Anglet OFF Architecture

Logemets Anglet is a conceptual project done by OFF Architecture. The project is a garden living situation taken to the extreme. The roofs of the apartment buildings slope down to grade and the design is intended to be overgrown. Nature is meant to be the designer here with minimal human interaction. This project is not meant to be in any type of city center, but is meant to blend into the rural or suburban landscape. From this standpoint, the project really attempts to cover an apartment in a carpet of foliage, utilizing earth sheltered design, but not design the natural environment for the use of the inhabitants. Because of this the apartments appear very different and even out of place with their context. Circulation resembles that of a motel with a common staircase and long cantilivered balconies. The project shows an example of a design that attempts to disrupt its site as minimally as possible. [16]

[16] Images and Info courtesy of "OFF Architecture: Logements Anglet in France." Designboom OFF Architecture Logements Anglet in France Comments. N.p., n.d. Web. 15 Apr. 2013.

site selection

Site (specific) Selection:

The preliminary research of this project dealt with a site-less study of variables based on a set of urban criteria. Moving forward towards a design conclusion though, I faced the challenge of settling on a specific site to utilize for the project. I began by taking my initial research and looking at the qualities that I had been dealing with. I found that the site toptenz.net had previously compiled a list of top cities based on a their “size, vibrancy, architecture, businesses, and general aesthetics... for city centers that are among the most impressive in the world.” From this list that included cities such as New York, Boston, Seattle, Miami and Detroit, I began to make my own investigations. I found that the city of Milwaukee, Wisconsin would be a good fit for this thesis.

The Midwestern city of Milwaukee is located on the West coast of Lake Michigan in Wisconsin. The site preserves the challenge of seasonal climate change and provides some solid demographics to work with. [17] The city has a population of just under 600,000 people. It also has a downtown housing occupancy rate of just around 95%, making it a strong core from which to build. In addition, the city center has seen more than 2 billion dollars in development (almost 600 million of which in the residential market) since 2005 with 194 million dollars in future developments still on the table. [18] This atmosphere of a growing downtown, coupled with the cities high occupancy rate shows that the area might be ripe for new housing ideas. Finally, the city has committed to becoming a hub for

[17] “Milwaukee, Wisconsin.” (WI) Profile: Population, Maps, Real Estate, Averages, Homes, Statistics, Relocation, Travel, Jobs, Hospitals, Schools, Crime, Moving, Houses, News. City-Data.com, n.d. Web. 11 Mar. 2013.

[18] “2012 Investment Map.” Milwaukee Downtown.com. City of Milwaukee Planning Department, n.d. Web. 8 Jan. 2013.

aquaponic research and development.

The city of Milwaukee has adopted this type of urban farming as one to make a brand of their city. [19] A recent study done by IBM recommends four main points for the city government to consider:

1. Form an Urban Agriculture and Aquaponics Council, based on the successful model of the Milwaukee Water Council. The new council would advance science and business success through sharing of knowledge, innovation and technology by for-profit, nonprofit and public sector stakeholders.

2. Establish an Aquaponics Innovation Center to help area universities and K-12 schools transfer technology and develop skills. The center also would evaluate new aquaponics technologies and help develop aquaponics businesses by analyzing best practices and economic impact.

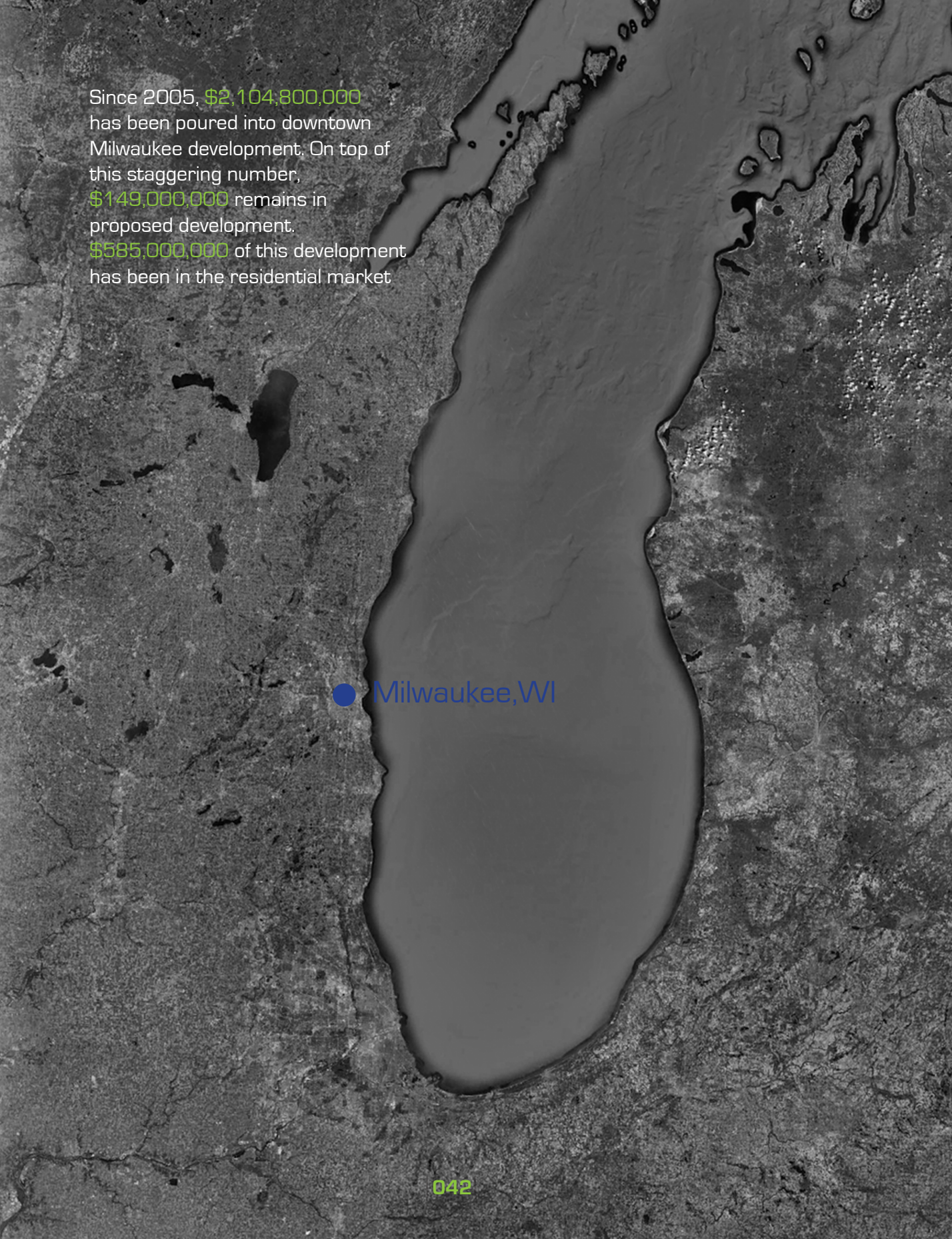
3. Do a market analysis of aquaponics production, supply chain expansion and market opportunity to guide industry expansion.

4. Expand the city's Office of Environmental Sustainability to advocate urban agriculture and aquaponics. [20]

Each of these points shows a way in which the city will be gearing its efforts to keep up with the growing field. The mayor expects the recommendations to move forward and be adopted by city government. This unique scenario of a government backing an expanding market movement and provides a platform from which to exercise my thesis.

[19] United States. City of Milwaukee. Dept. of City Development. Urban Agriculture. City of Milwaukee, n.d. Web. 11 Mar. 2013.

[20] Herzog, Karen. "Milwaukee Recognized for Urban Farms, Aquaponics." Editorial. Journal Sentinel [Milwaukee] 19 Sept. 2011: n. pag. Milwaukee Recognized for Urban Farms, Aquaponics. Web. 2 Feb. 2013.

An aerial photograph of the state of Wisconsin, with the Great Lakes visible to the west and north. The state is shaded in a dark gray tone. A blue dot marks the location of Milwaukee on the western shore of Lake Michigan. The text is overlaid on the upper left portion of the map.

Since 2005, \$2,104,800,000 has been poured into downtown Milwaukee development. On top of this staggering number, \$149,000,000 remains in proposed development. \$585,000,000 of this development has been in the residential market

● Milwaukee, WI

General Characteristics:

The city has a strong highway system and a very accessible downtown sector. There is easy access to Lake Michigan as well as the river system that runs within the city. Bridges, both vehicular and pedestrian frequently cross the rivers allowing for many routes of transportation. Green space includes a system of smaller parks outside of the downtown area, with a large public park to the North of the marina.

The general downtown area is comprised of three main sections: The Stadium District sets between the highway and the river inland of the Downtown Business District that sets between the river and Lake Michigan. The third section is the Old Town that is just North of the port, enclosed by the highway at its North end and water on the other three sides.

City (General)

Main Transportation, Waterways and Greenspace



City Zoning:

The city is zoned with a Downtown Business District (red) at its center with Community Greenspace (green) along the waterfront. The majority of land south of the city utilizes the river as an asset to Industrial (white) production. The city is surrounded by areas zoned as residential (yellow), commercial (blue) and mixed commercial (purple).

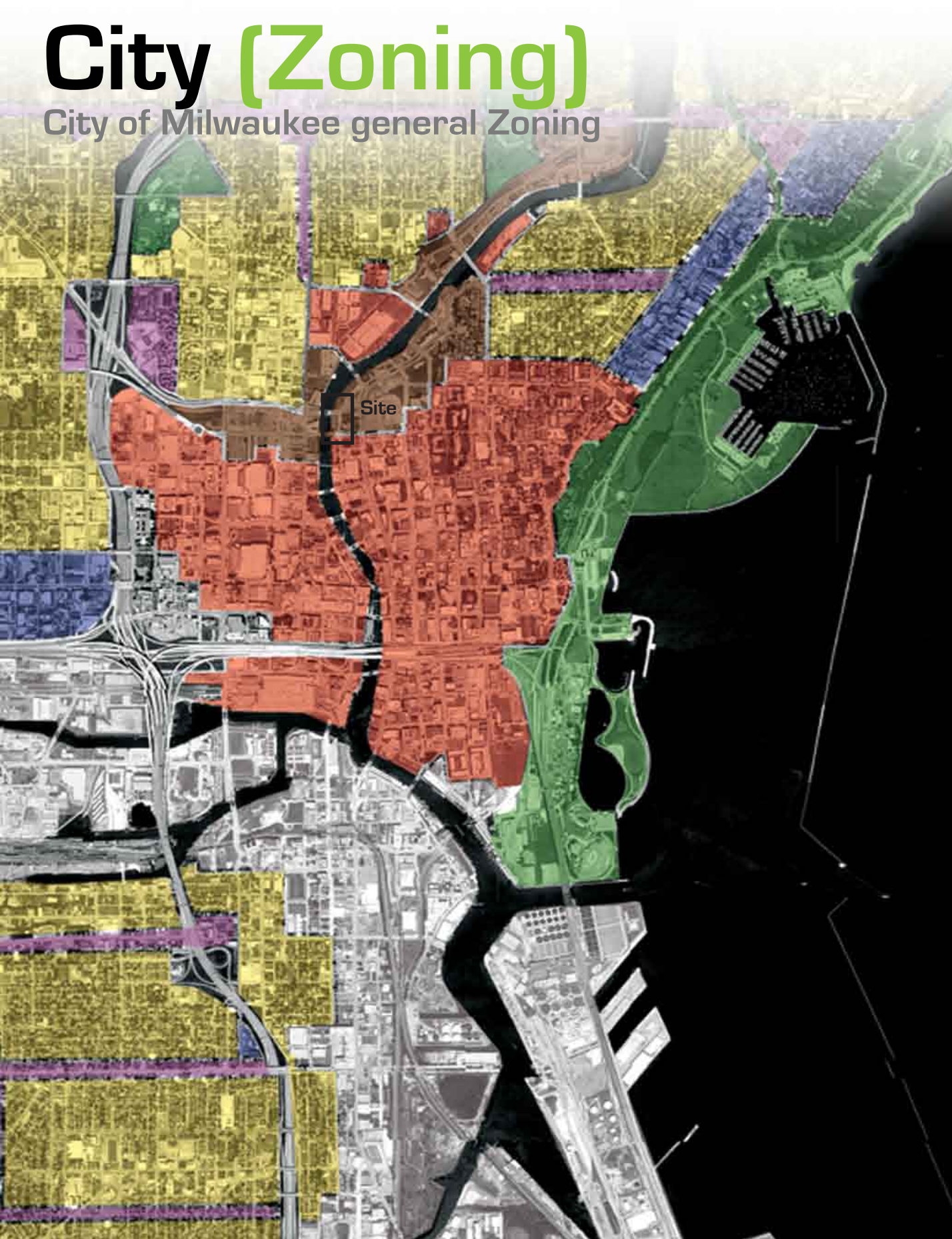
One interesting thing about the city's zoning is that there is only one portion specifically zoned as multifamily residential. This area, shown in brown is currently a developing area and the focus of the majority of this type of development in the city. My site is within this zone and transforms what is currently a parking lot into a multifamily residential development.



Image courtesy of Google Earth

City (Zoning)

City of Milwaukee general Zoning



Site (General)

Main Transportation, Waterways and Greenspace



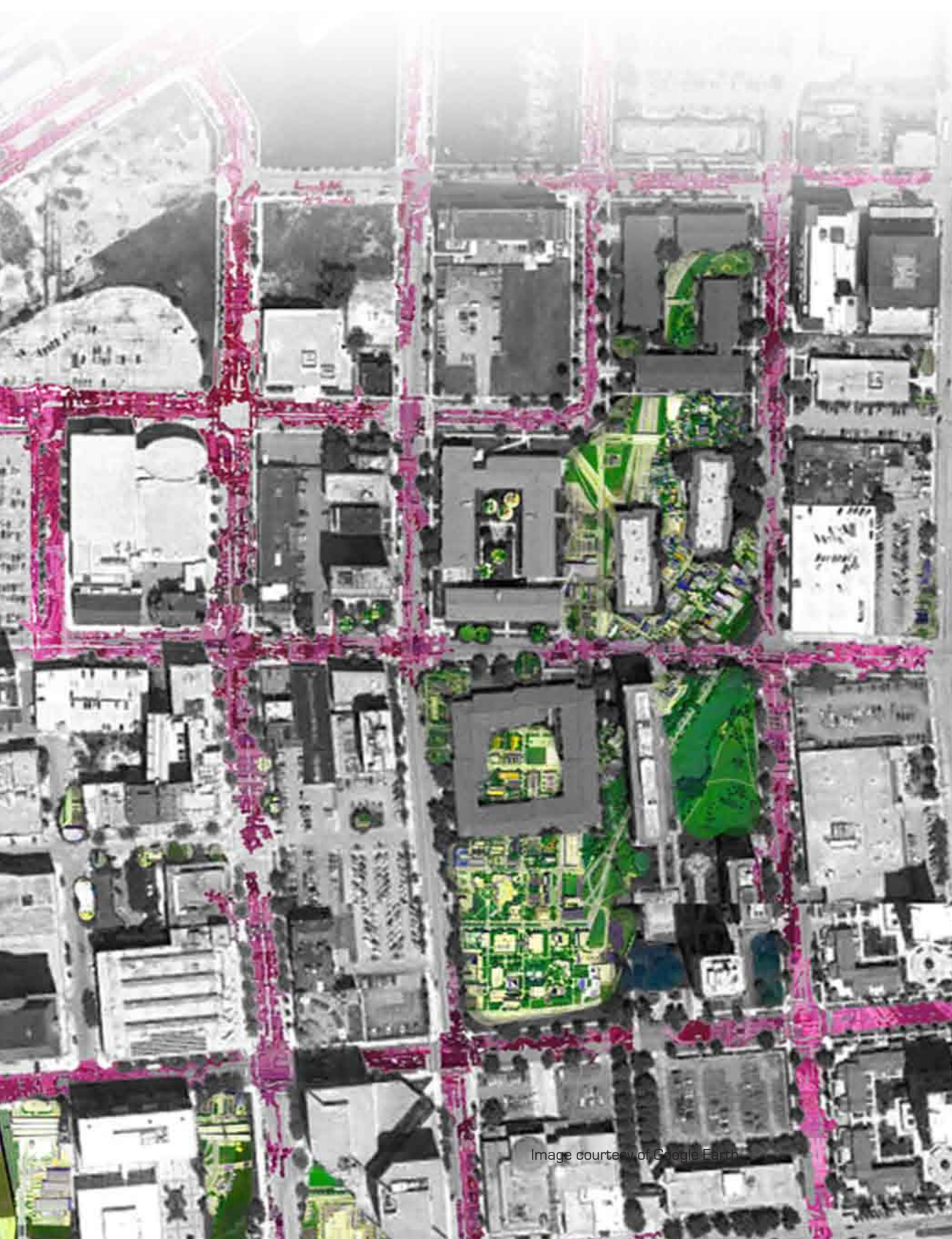


Image courtesy of Google Earth

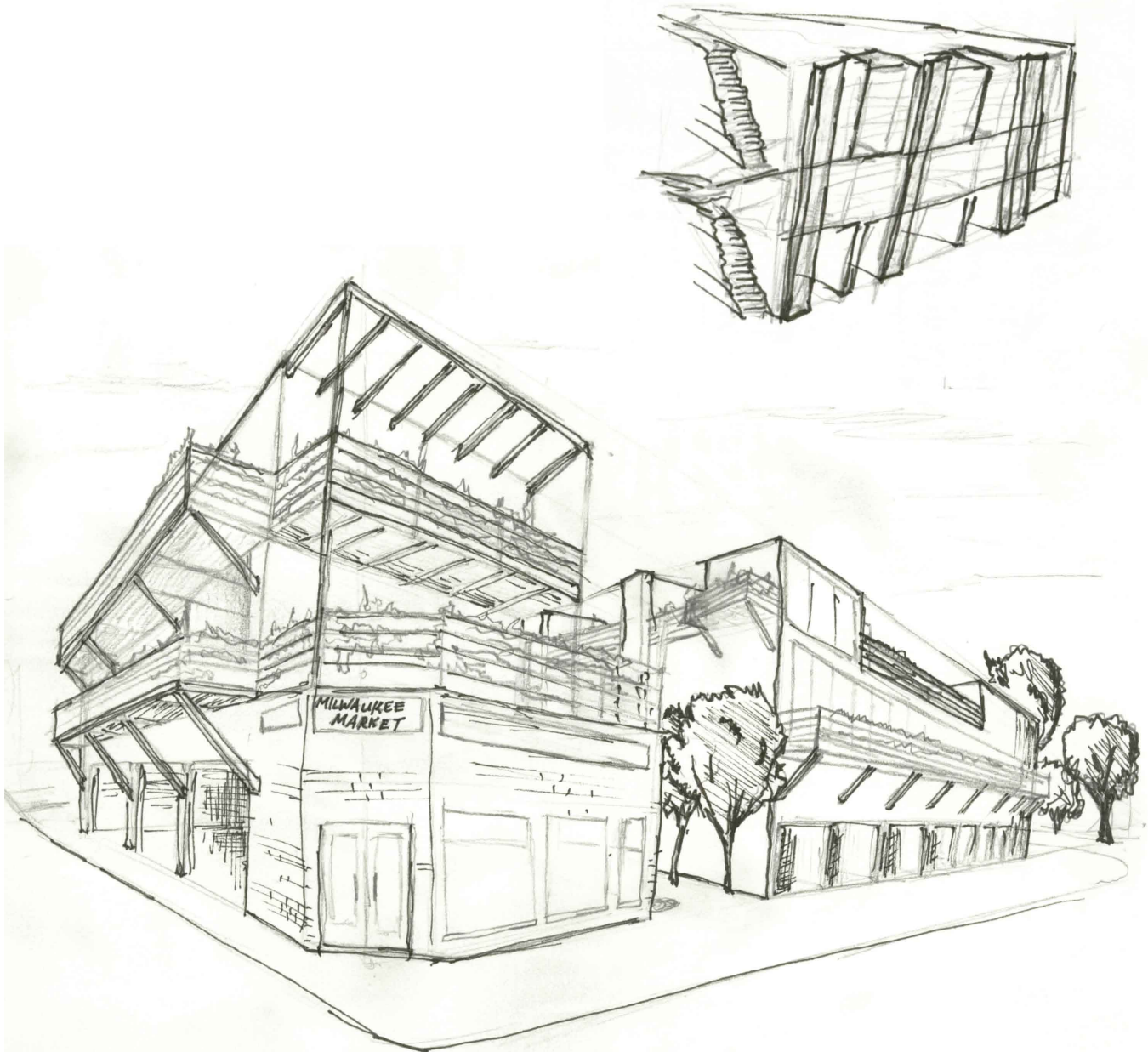
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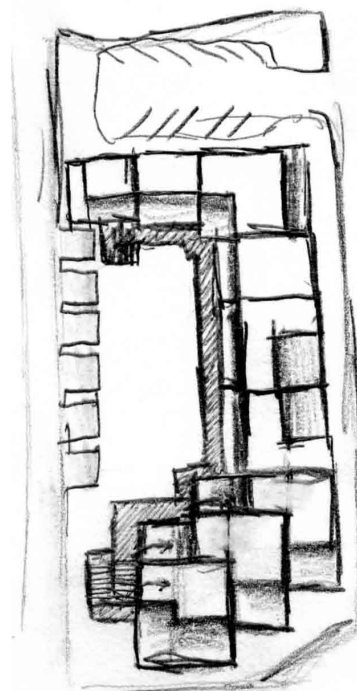
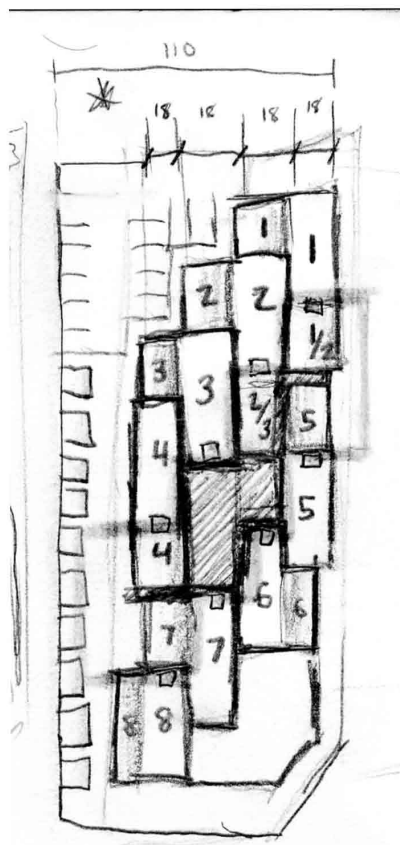
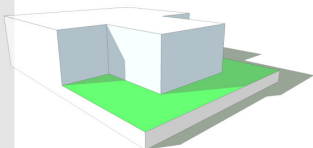
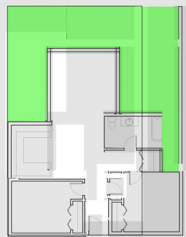
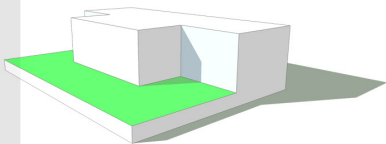
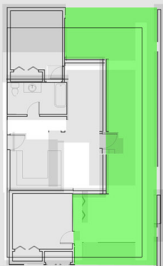
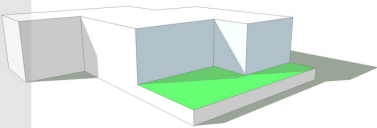
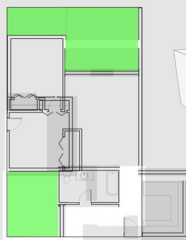
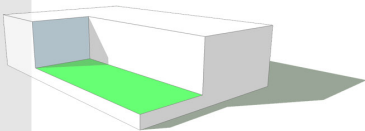
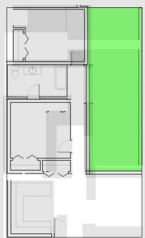
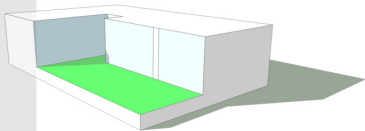
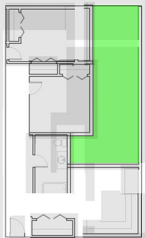
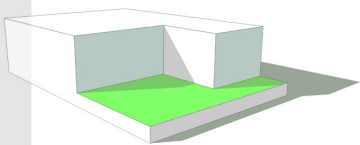
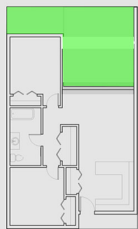
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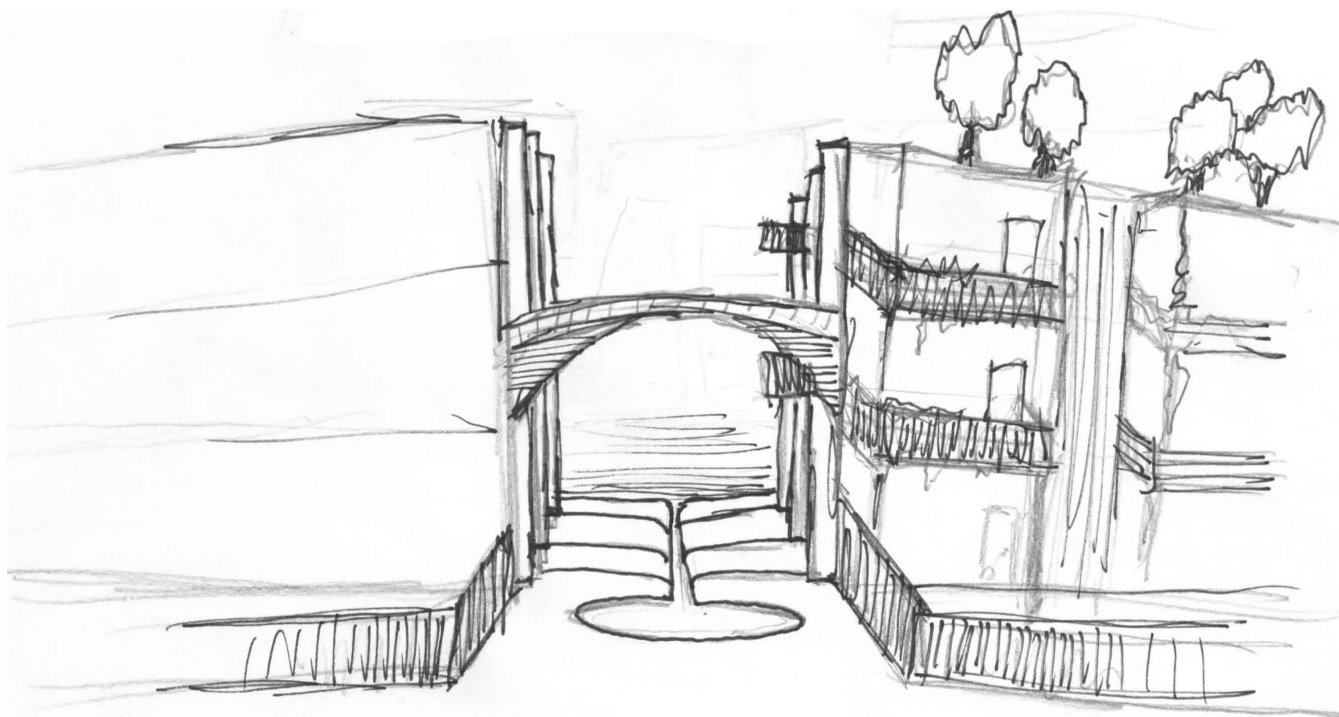
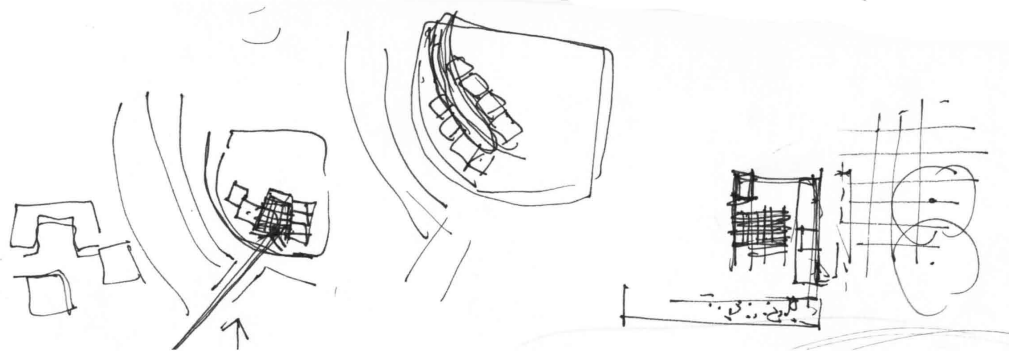
This project is primarily an urban living situation. The project is comprised of thirty housing units, a covered parking area, three defined outdoor public spaces, front office space, personal storage space, and circulation arteries. Units are between 400 and 900 square feet in plan, and accommodate both one and two bedroom living situations. Additional square footage upwards of 150 to 400 square feet is adjoins each unit individually and is intended for seasonal use as an extension of the living space. It is also of note that these units are intended to be occupied by a mixed income community. Each unit within the development has its own aquaponic system of varying size and orientation. The system will have an indoor and outdoor component in each unit to create flexibility between changing seasons.

The thesis will attempt to demonstrate an alternative thinking to that which says we must be indoors to be safe and comfortable. It will present an architecture where garden living through aquaponics can elevate the standard of ones life physically, mentally and emotionally and present a cultural component that will lend to the already vibrant community. We have proven that we can invigorate a place through working green spaces, now what can we do in our homes to make this concept a real and beneficial idea for the future? I hope to provide a model that elevates the occupant's standard of life through an architecture that provides opportunities for outdoor living at the personal and community level, while remaining sensitive to the urban condition.

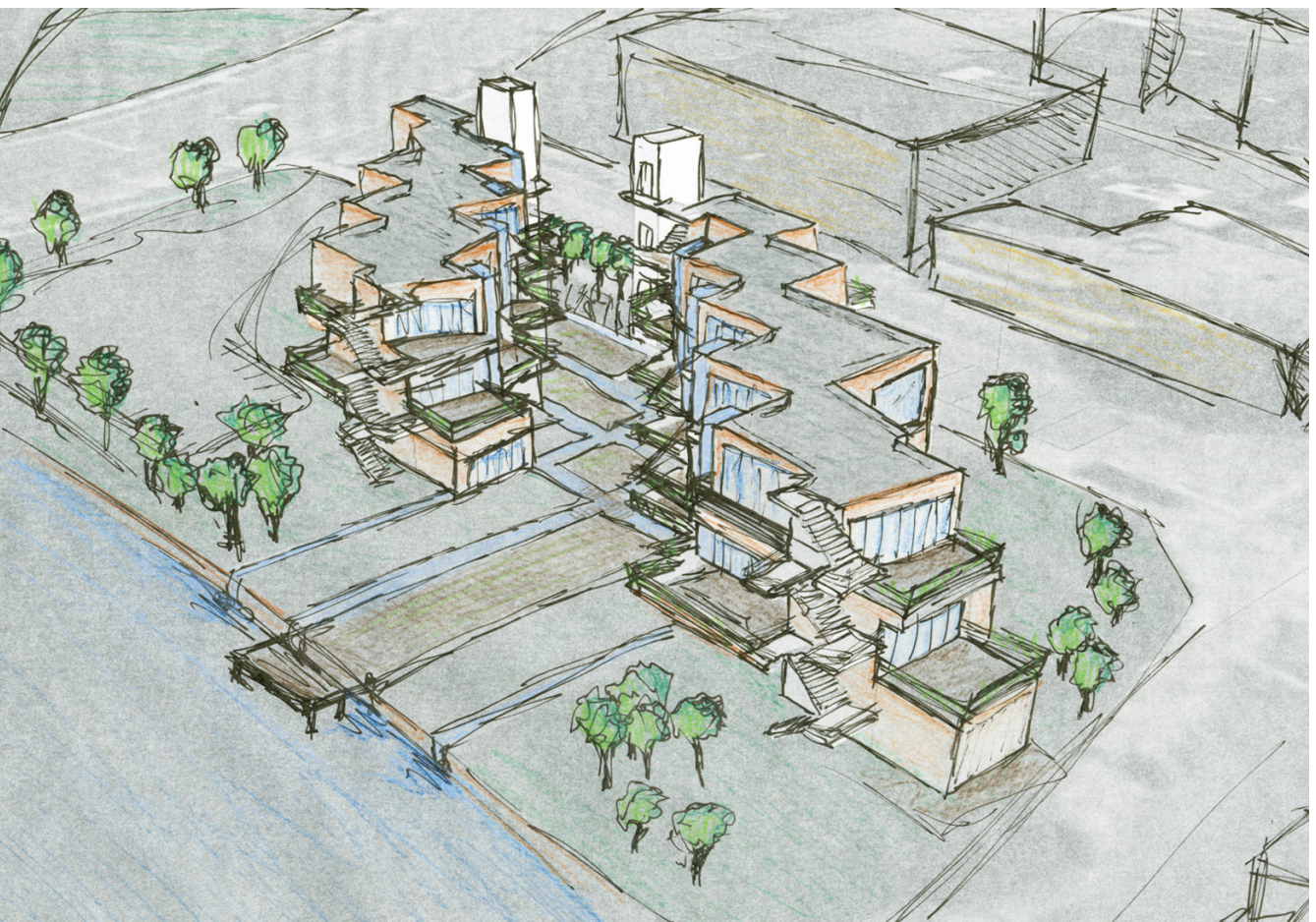
preliminary design

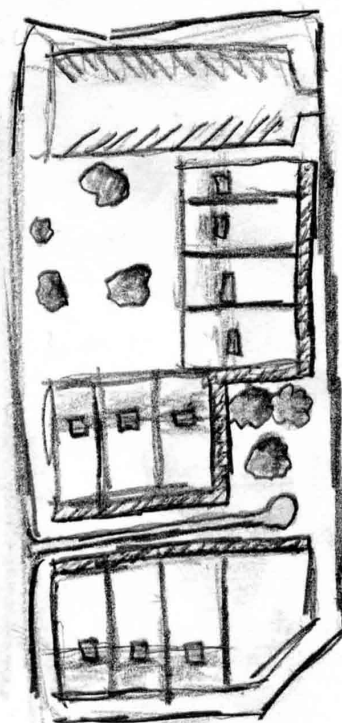
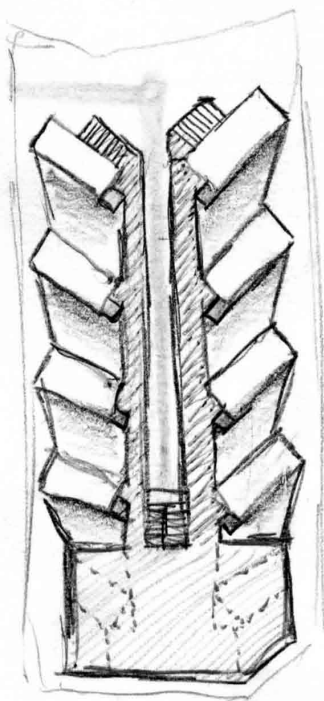






Preliminary design work focused on the dichotomy between the form of the individual unit and the complex on the whole. I found that the overall form was made much more difficult by the requirements of the unit. For example, attempting to retain sensibly good views for each unit while keeping setback and sunlight considerations in mind as well as keeping logical circulation paths became very frustrating. Original plans settled on a stepped form that allowed access to units while also retaining views of the water and downtown and keeping balconies on the East, South and West facades. Couple these concerns with the aquaponic system integration, parking and public spaces and you have a very complex design problem to deal with.





final design

Site (Plan)

Fl 1:

28 Parking Spaces
Administrative Space

1.1 = 650 sqft

1.2 = 650 sqft

1.3 = 650 sqft

1.4 = 650 sqft

1.5 = 580 sqft

1.6 = 580 sqft

1.7 = 580 sqft



Floor Plan (2nd)

Indoor/Outdoor Spaces and Circulation

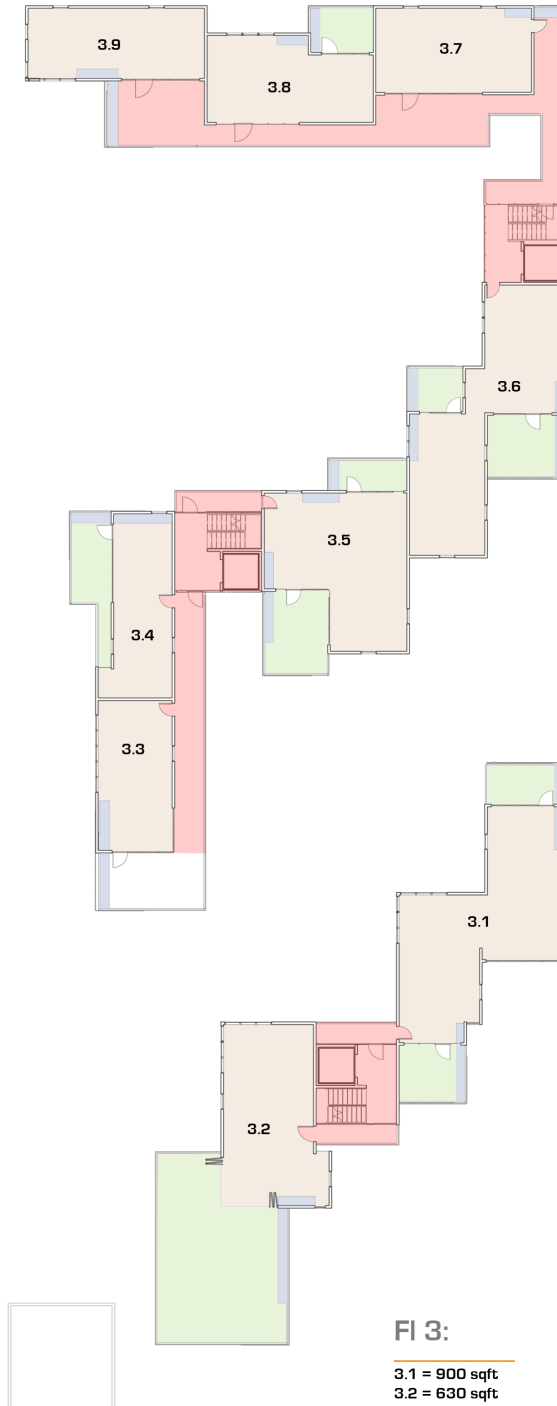


FI 2:

- 2.1 = 590 sqft
- 2.2 = 550 sqft
- 2.3 = 440 sqft
- 2.4 = 640 sqft
- 2.5 = 540 sqft
- 2.6 = 600 sqft
- 2.7 = 400 sqft
- 2.8 = 450 sqft
- 2.9 = 450 sqft
- 2.10 = 500 sqft
- 2.11 = 525 sqft
- 2.12 = 525 sqft
- 2.13 = 450 sqft
- 2.14 = 500 sqft

Floor Plan (3rd)

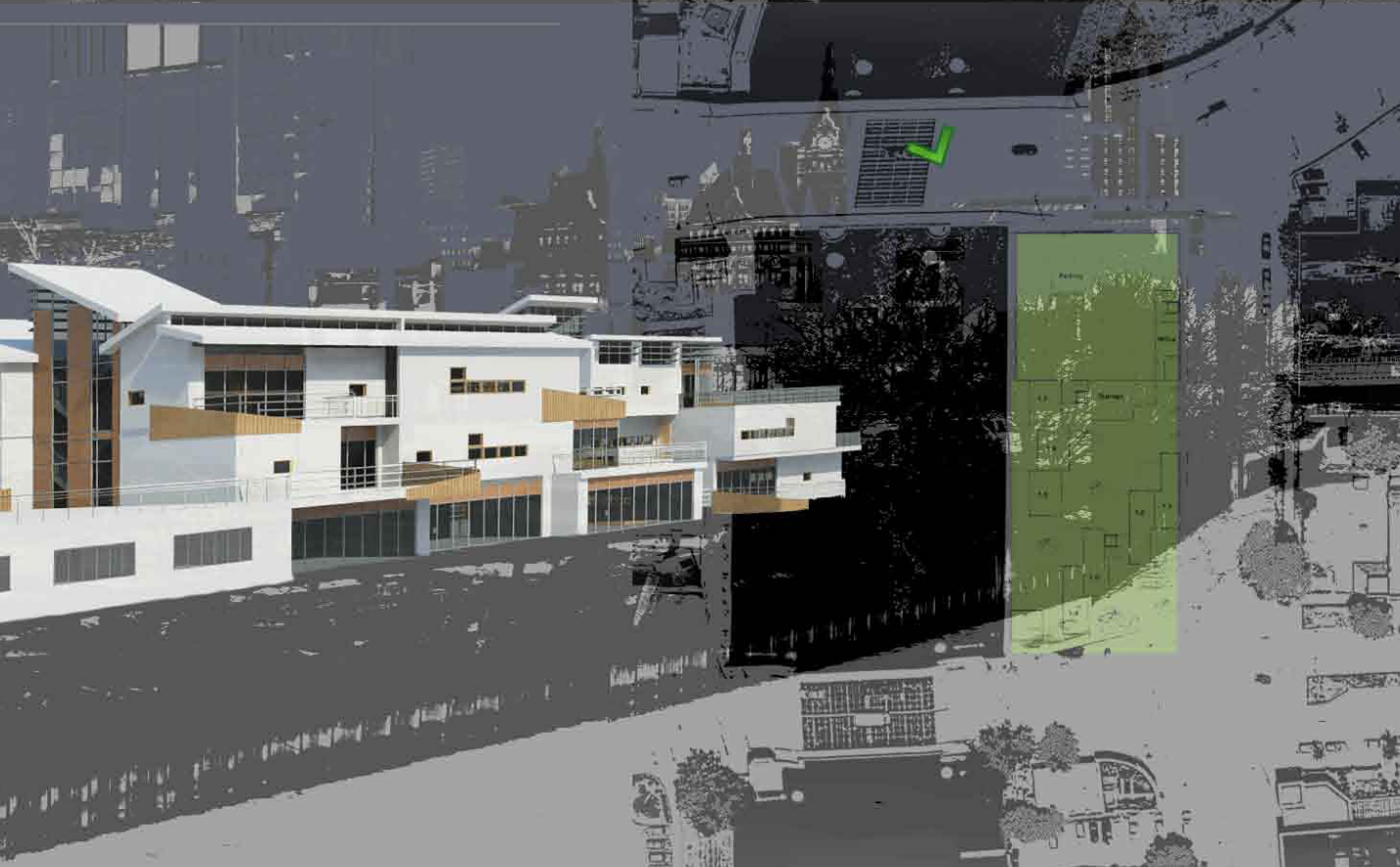
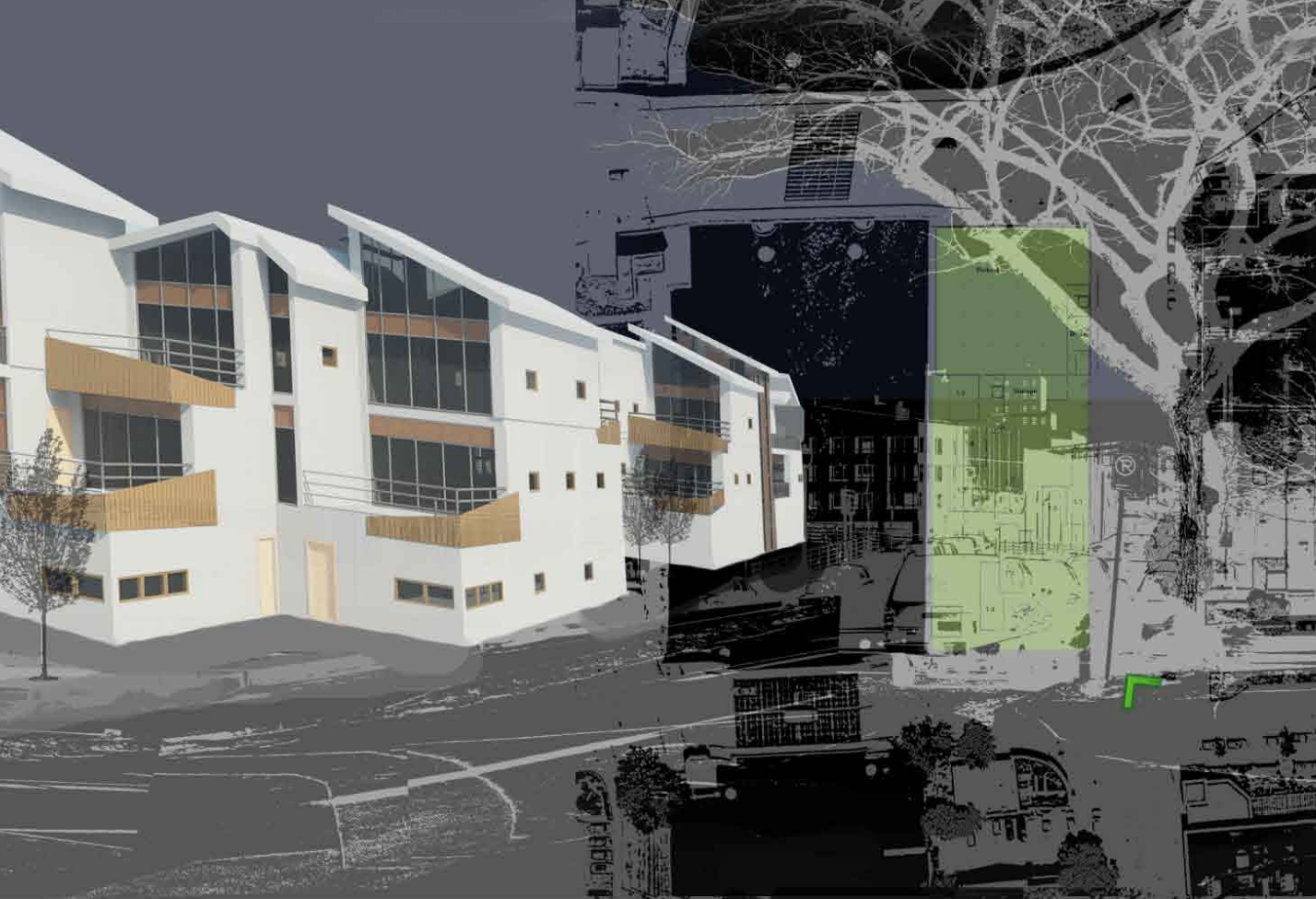
Indoor/Outdoor Spaces and Circulation



FI 3:

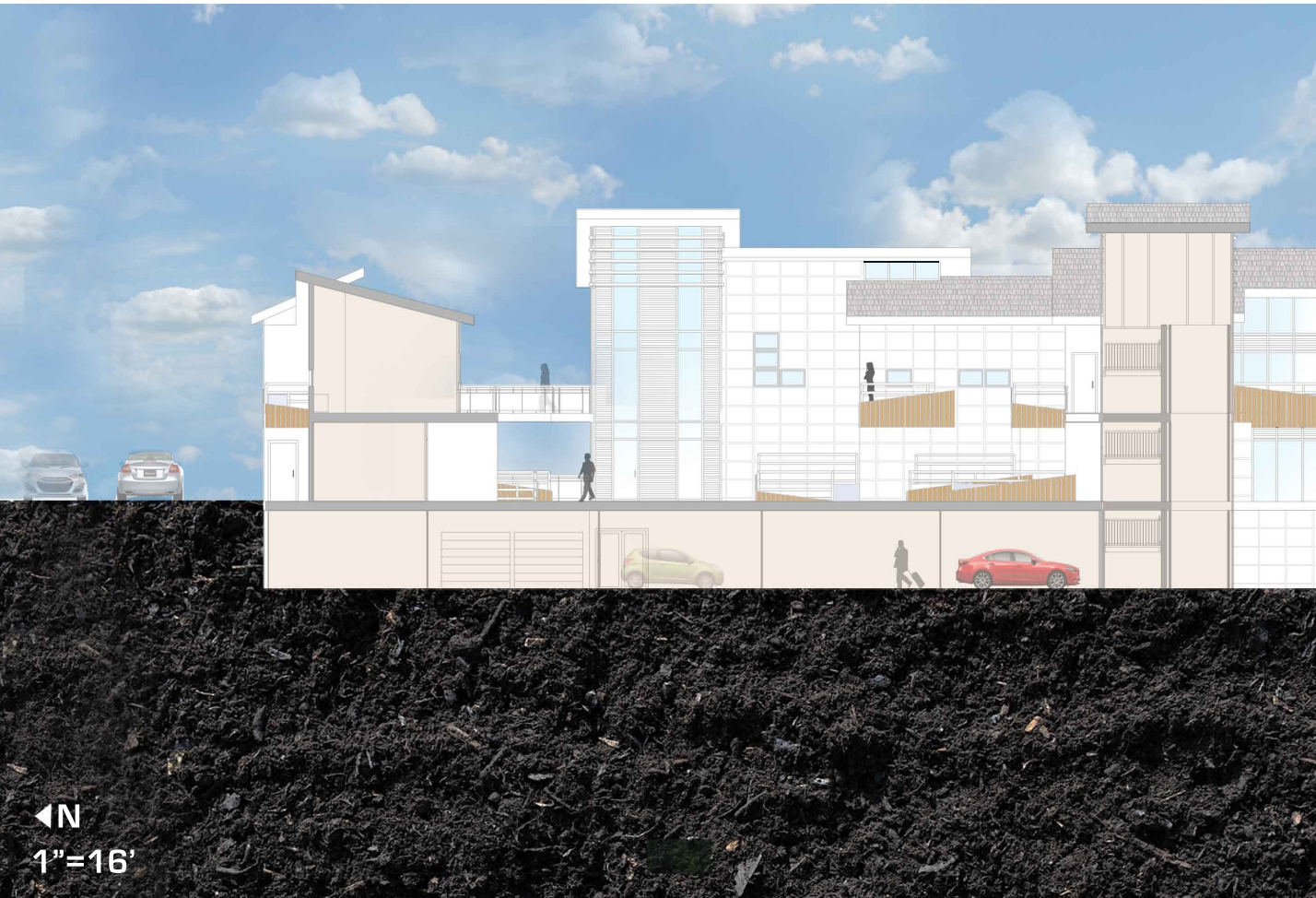
3.1 = 900 sqft
 3.2 = 630 sqft
 3.3 = 450 sqft
 3.4 = 475 sqft
 3.5 = 720 sqft
 3.6 = 900 sqft
 3.7 = 500 sqft
 3.8 = 515 sqft
 3.7 = 450 sqft

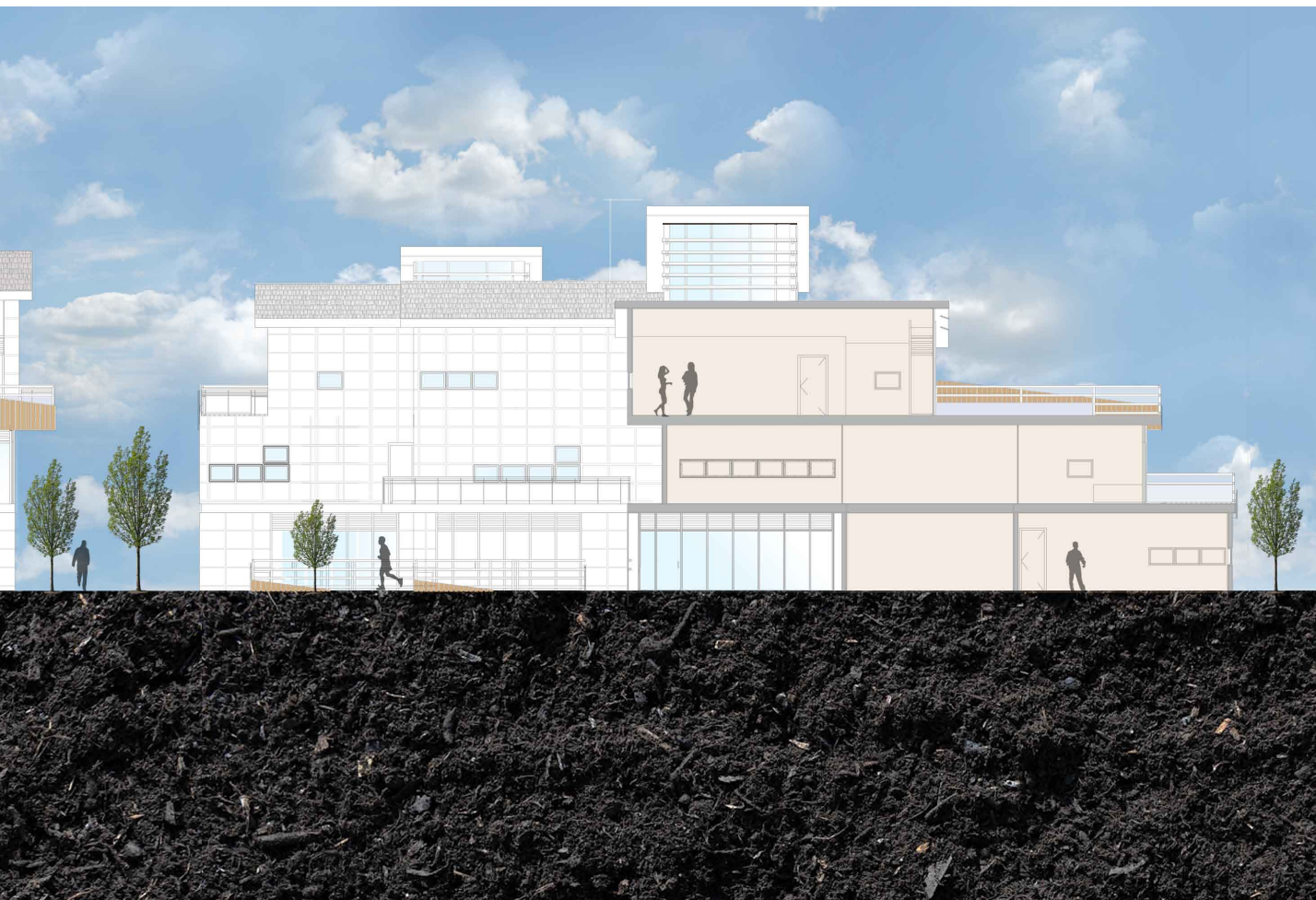




Site Section (A)

Longitudinal Site Section Facing East





The Site has two distinct levels of community space. There is the main level at grade and there is also the more private space created above the parking structure.



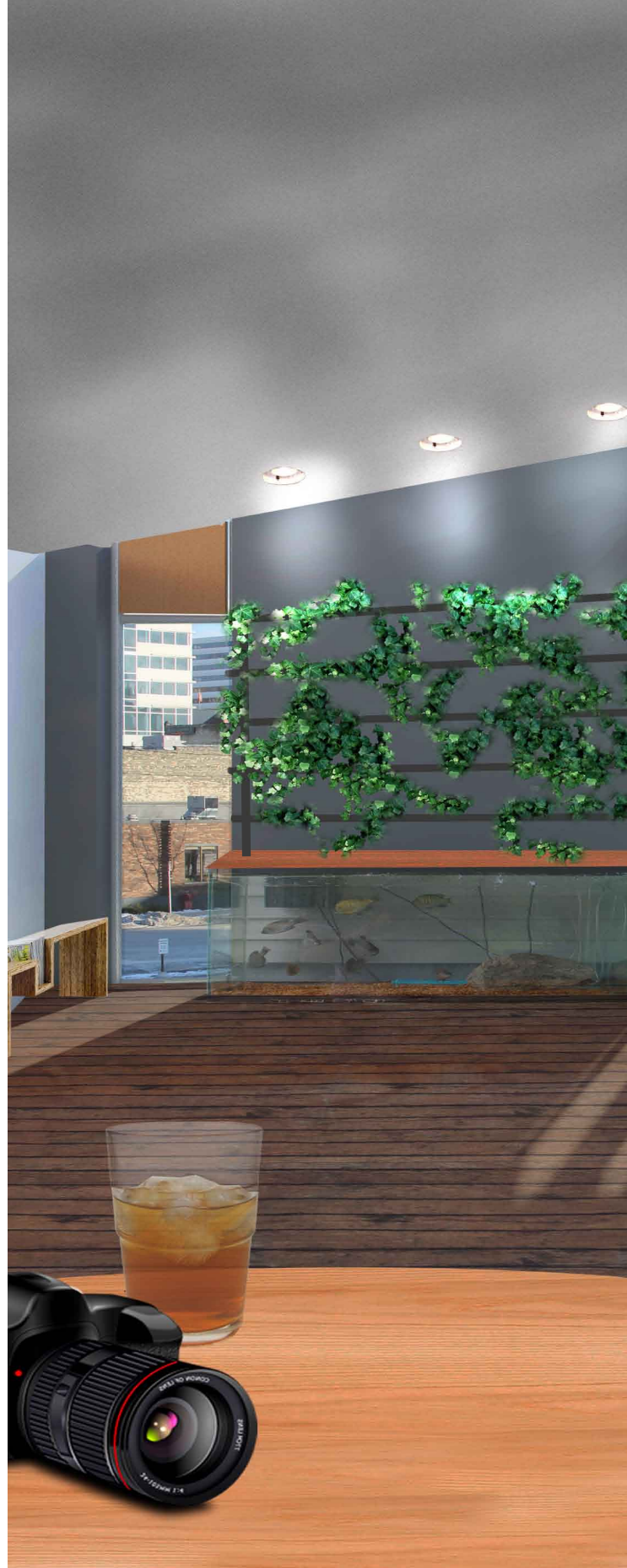


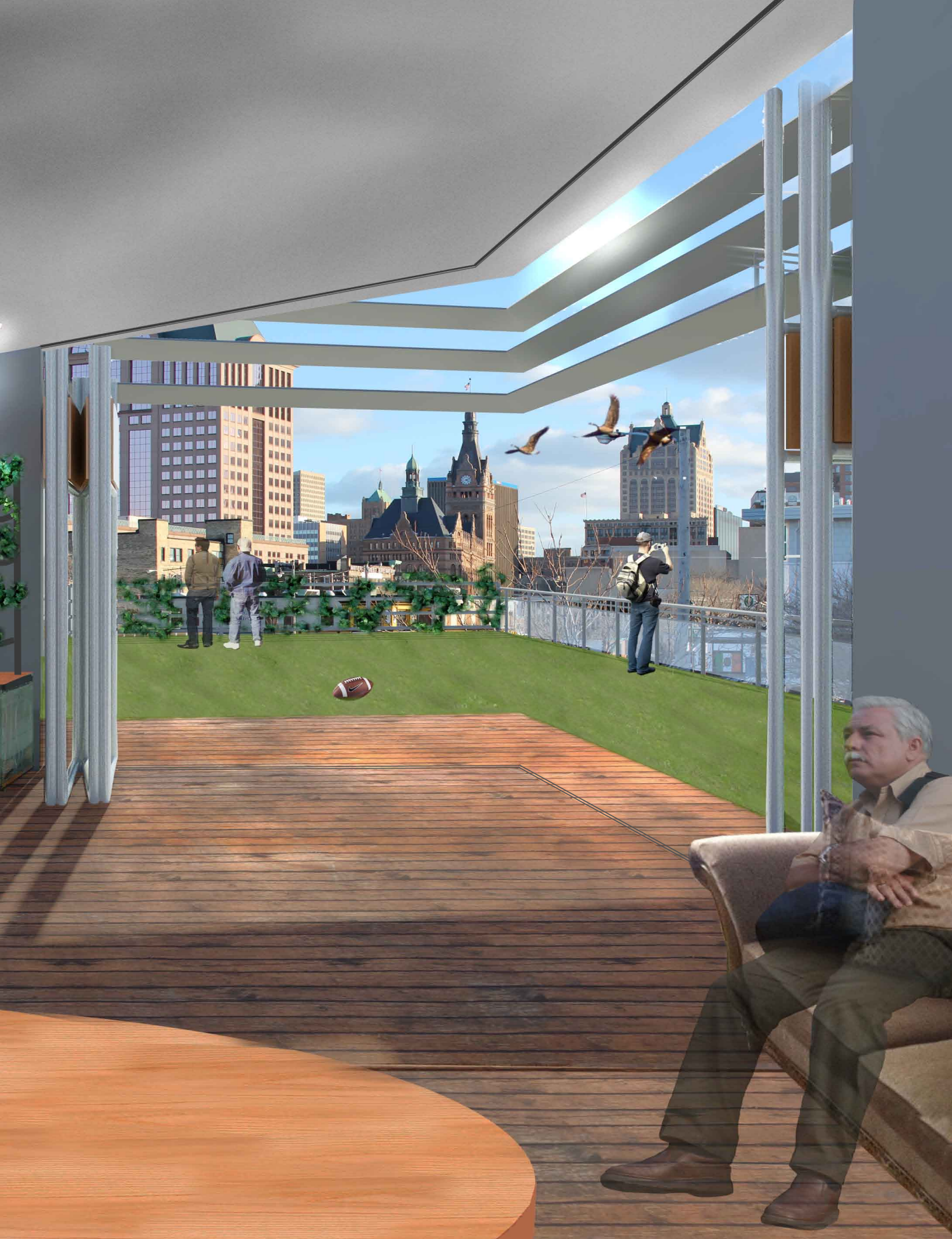




The interiors of the units are meant to feel as though they bleed into the outdoor spaces. A collapsible curtain wall system is used to allow the space to be opened up in fair weather. This outdoor space is intended to be utilized as an extension of the living space and to be a place where people can relax, eat dinner, entertain and work with the integrated aquaponic system.

Shown here is the system as it might appear in a built unit. The aquaponic system has an indoor and outdoor component that work together. On a nice day as pictured, the system works with the open plan to give a natural and comfortable feel to development located on a bustling urban site.





Bathroom

Bathroom will have all tile with glass entry door. The shower will not be enclosed by itself, rather the whole space shall serve as a

Bedroom

The bedroom will be small with a built-in shelving and drawer unit on the partition wall of the room. Other storage and built-in options are current design ideas.



Entrance

Located on the West wall.

Wall Penetrations

Could be a key feature in allowing light to filter through the space while allowing for a screening effect into the bedroom. It adds an architectural feature that breaks up what might have been a 12 foot hallway.

Wood Floors

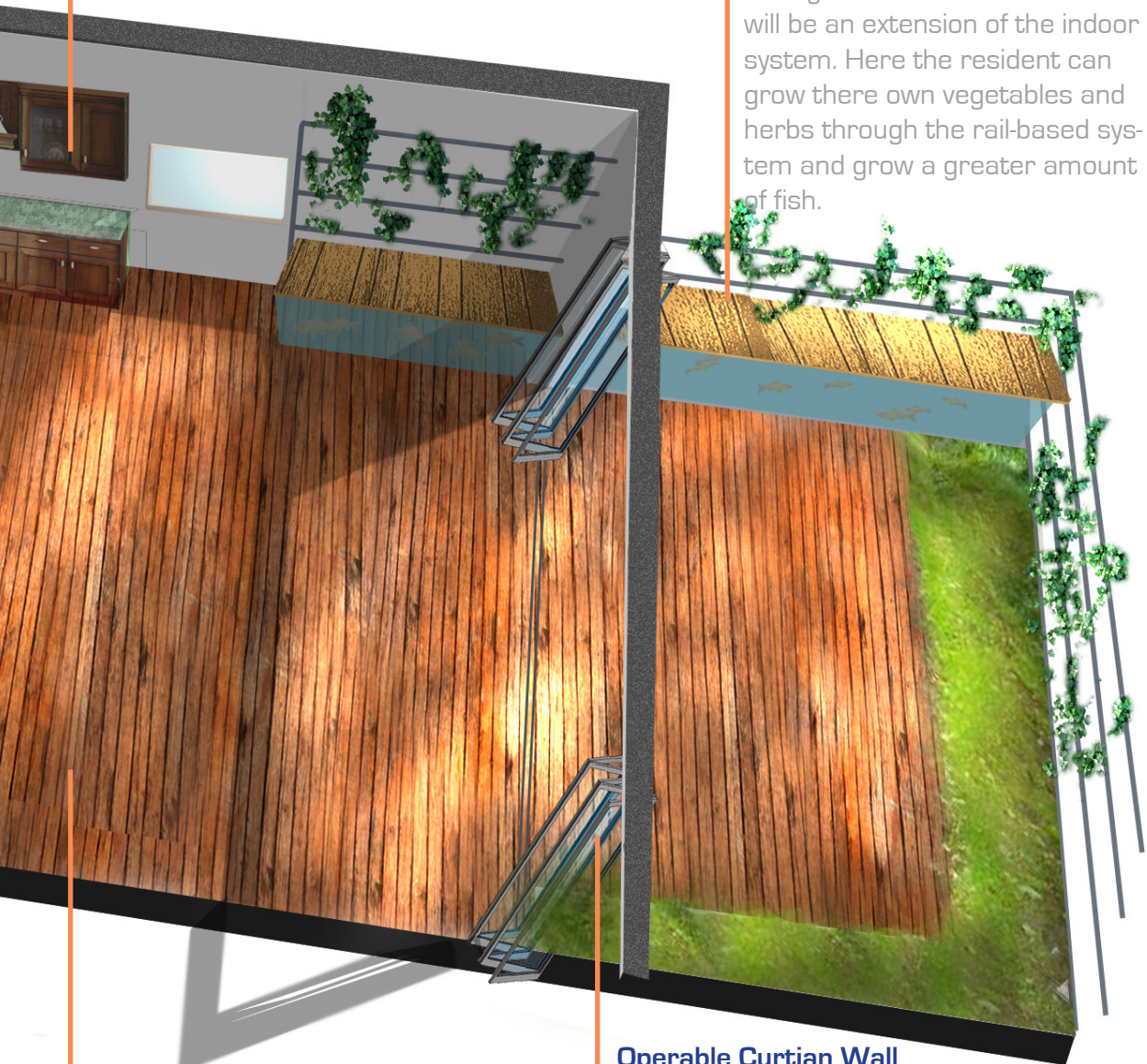
Using a wood flooring allows an easy natural transition between spaces and minimizes maintenance. Using reclaimed wood will give the floors a modern reuse feel.

Kitchen

A small kitchen is all that is necessary for a small couple or individual. This allows more of the unit to be allocated towards other living functions.

Aquaponics

The indoor aquaponic system will be for low-light types of plants to add color and life to the space. They will survive through the winter months and provide a means of continued fish harvesting. The outdoor system will operate during the warmer months and will be an extension of the indoor system. Here the resident can grow their own vegetables and herbs through the rail-based system and grow a greater amount of fish.



Open Layout

The overall open layout of the space is intended to maximize space that is at a premium in this housing development. It also allows for light and breezes to be easily filtered through the space.

Operable Curtian Wall

Allows the space to be opened up to the outdoors when the weather is mild and allows the livable square footage of the unit to be vastly increased. This does not only blend indoor and outdoor spaces but essentially turns one into the other.

conclusions

Conclusions:

As stated before, this thesis was not meant to be a solution to the issues inherent to city living. Not was it meant to point out that there needs to be a drastic change in the way that we live in cities. This thesis was a way for me to rethink how we do live. The final project has been designed with the notion that this might not be the type of living situation that would work for every person, but would be a bold move towards creating a situation for those willing to partake.

Through this thesis I learned a lot about the urban condition and the individual. I also learned a lot about myself and discovered certain talents, weaknesses, desires and interests that I had not previously known. This project is a development and study of how a living situation can merge with a productive landscape within an urban setting. In the end the projects aim became more than a program attempted to create an idea. What would it be like if everyone had access to their own outdoor green spaces within their living space? How would a system such as the one proposed through this thesis begin to influence the way in which we live in cities? I think that we could really enhance the way in which we live in cities, and it might just start with a little green in the mix.

Thank you to my family and friends who have supported me throughout this journey. I could have not done it without the support of my parents, Darryl and Karen Armstrong who have been an example the opportunities that come through hard work and faith. It has been an incredible journey and I have learned so much through my experiences in the classroom and in life. It is bittersweet to realize that my collegiate career will soon come to a close but I am eager to see what the next chapter of my life will hold.

Thanks,

Ian Armstrong

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