submerge:

urban surface adaptations

carlton hines

Submerge: Urban Surface Adaptations

by

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A dissertation submitted to the Graduate Faculty of
Auburn University
in partial fulfillment of the
requirements for the Degree of
Master of Landscape Architecture

Auburn, Alabama
May 16, 2014

Keywords: impervious surfaces, democratic space, subterranean, ecological

Approved by

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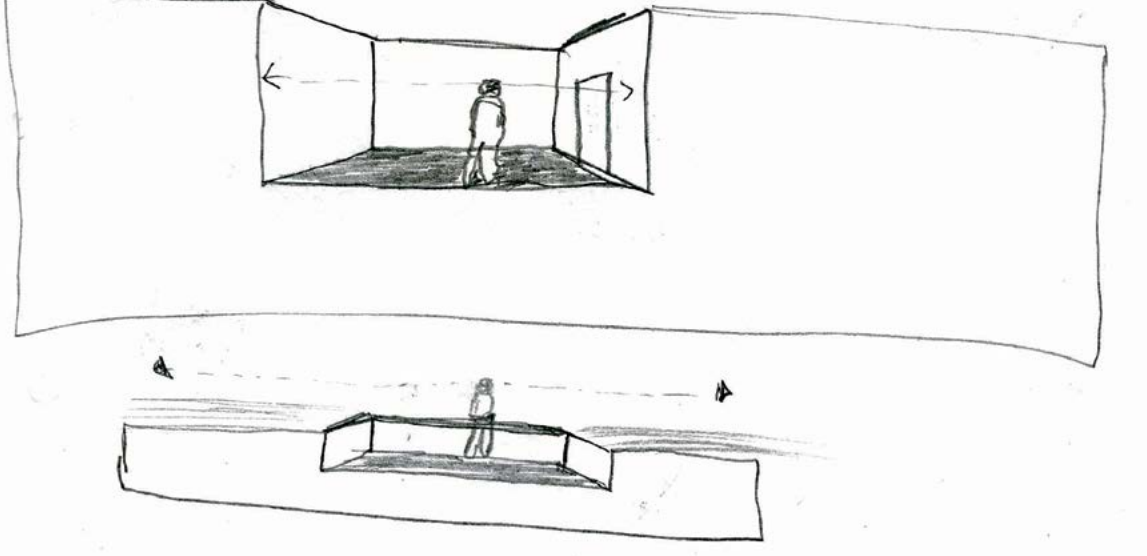

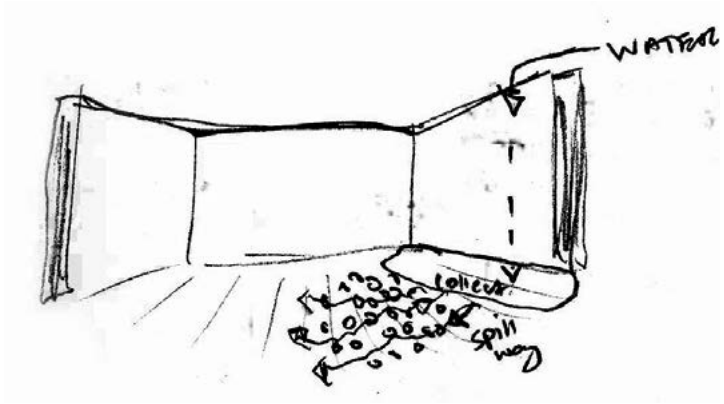
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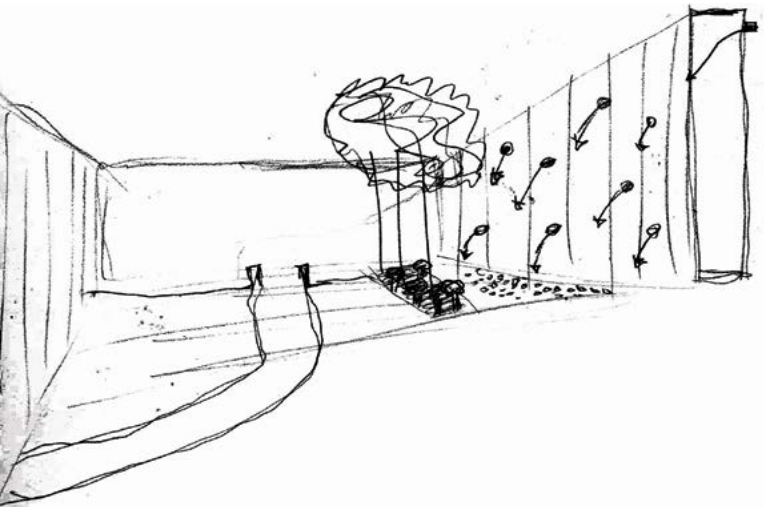

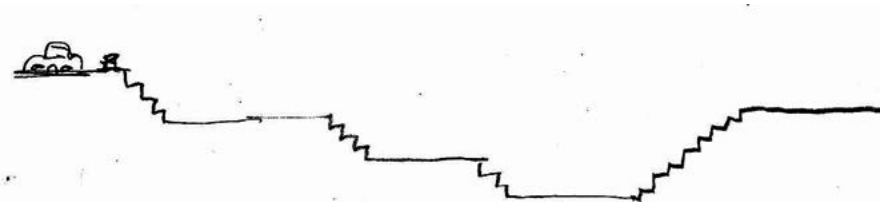

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Spring 2014

Special thanks to my mom, dad, and brother who have been sources of inspiration throughout my life. Thank you for always giving your full heart, no matter the circumstances, and for allowing me the freedom to become my own person.

Thanks to my mentors Holly Morrison and Nigel Rolfe. Without your help and guidance, especially throughout the graduate application process, I would not be in this position today.

Thanks to Holly, Nigel, Sally Bowring, Ron Johnson, and Richard Roth for spreading your extraordinary, infectious, creative energies. VCU is lucky to have you as educators and leaders. I feel lucky to have worked with and learned from you.

Thanks to my landscape architecture mentors Tony Oates and Bob Tabor for being there to listen and critique. This thesis had a mind and direction of its own at times, which was both freightening and exciting. The meetings and talks at Panera and over the phone with you helped me through some very dificult times. Thanks for lending a hand and catapulting me forward during these scary, great, and inbetween moments.

Dan Ballard, Rod Barnett, and Charlene LeBleu were instrumental in my learning successes at Auburn University. It was a true pleasure learning from you, both inside and outside the classroom. Thanks for providing a positive learning environment, advancing my knowledge, and encouraging innovative design thinking. I will look back fondly upon these intense six semesters, which I liken to my past work/life experiences in New York City where I was chewed up and spit out, all for the better. Thanks for a fantastic landscape architecture experience in the Deep South.

Flint's Crossing Shopping Center looking northeast from University Drive

Submerge: Urban Surface Adaptations

impervious surfaces

"Asphalt may be among the most ubiquitous yet invisible materials in the North American landscape. Its scale and form practically render impossible the conception of it as a single bounded system, yet its function depends precisely upon the singular continuity of a horizontal surface. Highways, terminals, interchanges, offramps, medians, sidewalks, and curbs are such pervasive components of the built environment that they are often overlooked as influential characteristics of contemporary culture in North America. These seemingly disconnected elements form a distinctly engineered operating system that supports a multitude of regional processes and generates a wealth of contemporary programs, many of which lie outside of the conventional axioms of European-influenced theories of urban design and planning (Belanger 2006)*."*

The origins of impervious surfaces can be traced back to ancient times and the Romans who constructed roads as a means to move armies and battle gear across long distances at faster speeds with greater efficiency. Two thousand four hundred years later during America's industrial revolution and the advent of the automobile, dust and uneven topography made travel nearly impossible. With increased urbanization and the need for efficient transportation came expanded use of impervious surfaces, like asphalt. Similar to the sprawling form of U.S. cities today, impervious surfaces now cover thousands of square miles of America. These hard surfaces are so ubiquitous that we often forget about their impact upon our natural environment. Urban landscapes are dotted with under-used shopping mall parking lots, empty strip malls and abandoned factory sites to name a few. This creates an increasing opportunity for designers to rethink how we re-use some of these spaces in ways that are informed by social, economic and ecological strategies.

"One of the most underrepresented materials, and one deserving of greater attention, is asphalt, which may be among the most important materials in the history of North American urbanization (Belanger 2006)."

Several designers have inspired this thesis acknowledging the limitations of impervious surfaces by applying social, economic, and ecological strategies to improve them. They include Michael Van Valkenburgh Associates, Inc., HDR, Inc., and Stoss Landscape Urbanism. Michael Van Valkenburgh's parking lot design at the Herman Miller manufacturing plant in Canton, Georgia was influential in its reliance on a place-making strategy, acknowledgement of daily employee ritual, and the protection of ecosystems. HDR's design of Historic Fourth Ward Park in Atlanta, GA rehabilitated what was once a damaging flood prone area filled with cracked asphalt into an oasis that showcases water not as a waste source but as the unifying feature to a public gathering place. Stoss' Erie Plaza in Milwaukee, Wisconsin galvanized a small site into a successful space providing multiple social uses while spurring economic development and cleansing site stormwater.

abstract

“The traditional notion of the city as a historical and institutional core surrounded by postwar suburbs and then open countryside has been largely replaced by a more polycentric and weblike sprawl: the regional metropolis. Here, multiple centers are served by overlapping networks of transportation, electronic communication, production, and consumption. Operationally, if not experientially, the infrastructures and flows of material have become more significant than static political and spatial boundaries. The influx of people, vehicles, goods, and information constitute what urban geographers call the “daily urban system,” painting a picture of urbanism that is dynamic and temporal. The emphasis shifts here from forms of urban spaces to processes of urbanization, processes that network across vast regional-if not global-surfaces (Wall 1999)*.”*

Impervious surfaces are an ever increasing phenomenon throughout the world. They crop up at the local scale and proliferate into a global phenomenon that exponentially imperils natural systems. Their increasing presence offers a unique opportunity for designers to develop new surface strategies that can improve social, economic, and ecological conditions within local communities. This thesis employs a subterranean surface strategy, carving out subgrade rooms eight feet beneath a parking lot's surface, where nature and culture are not divided, allowing for cohabitation within a democratic space. The exploration occurs through several test iterations using various representational methods, including hand drafting, sketching, 3-D models, plans, sections, and perspectives. Strategies used are descriptive through observation, experimental through research by design, and deductive using case studies. The goal of this thesis is to show how impervious surfaces can be designed or re-designed to have a positive economic, social and ecological impact on a specific geographic area. Social impacts include emphasizing the high cultural value of parking lots, creating a user-friendly atmosphere and areas offering multiple uses that cater to various types of users throughout the seasons. Economic impacts include increasing overall use of the parking lot, providing a driver for dining and retail facilities on site, and building physical armatures that have the ability to spur future development for neighborhood growth. Ecological impacts include reducing stormwater flow, increasing groundwater infiltration, and reducing non-point source pollution.

Key Words: Democratic space, local and global networks, interactions, transportation, social, economic, ecological.

Research Question: How can designers utilize impervious urban infrastructure to improve the social, economic, and ecological conditions of an area?

rationale

"Embroiled in city life or steeped in the numbing silence of the suburbs, we move along, barely aware of the one solid thing beneath our feet: Asphalt – a prosaic and negligible material that subliminally signifies the urban in the Western world. Though it has completely transformed the surface of the earth in urban centers and small towns alike, we pay it little attention. No one would look at it, but we do tend to look down upon it. Asphalt is not of the earth like wood or stone; it isn't a precious material like marble. It's something we think of as cheap but expedient, a necessary evil (Zardini 2008)*."*

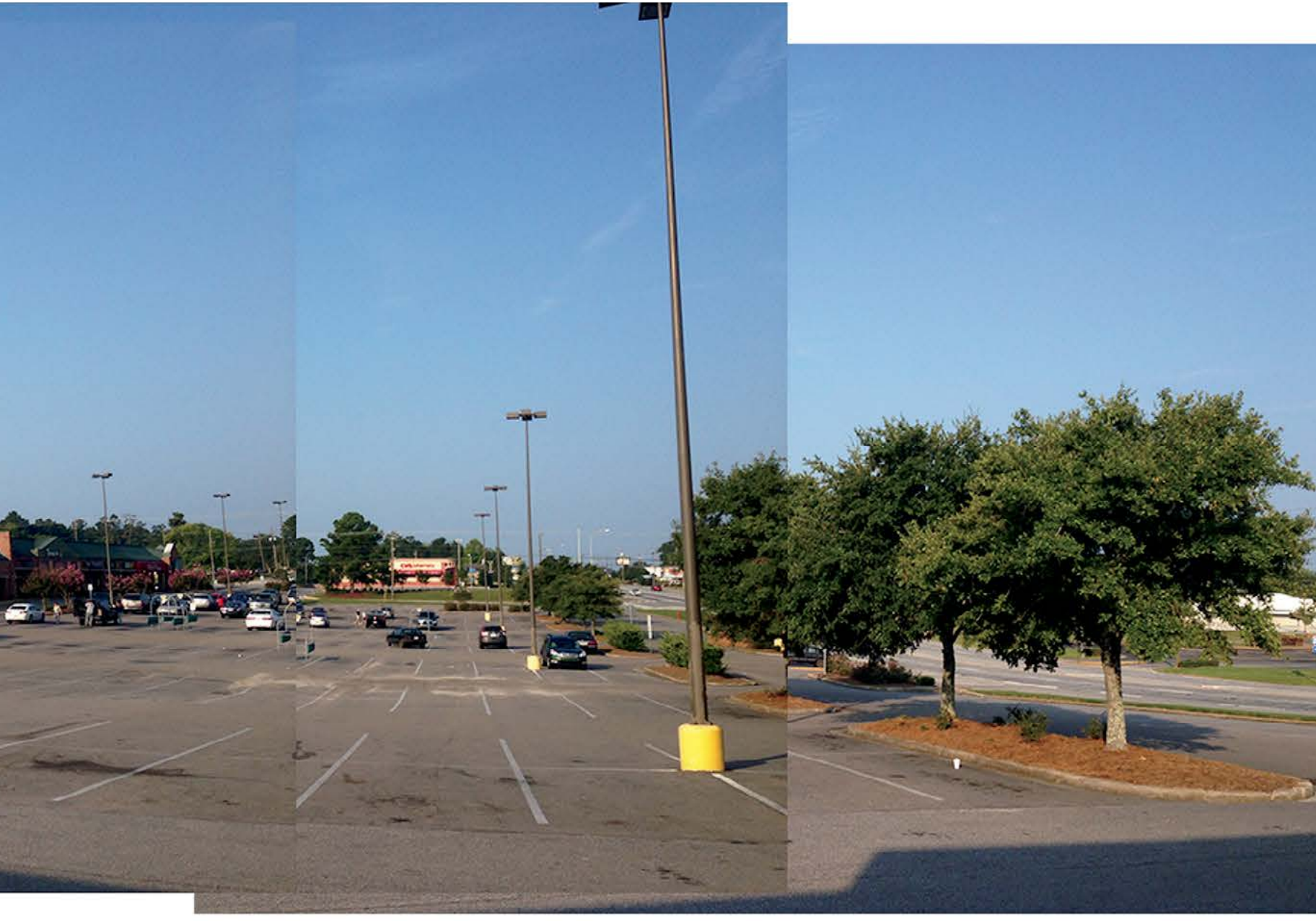
"There is no escape: Asphalt is the indelible element of urban experience. Yet for all its power to mask the earth's surfaces, asphalt lies curiously mute; and despite its status as the quintessential symbol of urbanity in the collective imagination, the powerful presence of asphalt in the built domain is repressed and effectively rendered invisible (Zardini 2008)*."*

Impervious surfaces have an enormous footprint that impacts natural systems on local and global scales. These static surfaces offer unique and increasing opportunities for designers, including landscape architects, to improve the social, economic, and ecological conditions within local communities.

where rubber meets road

Flint's Crossing Shopping Center: Existing Conditions

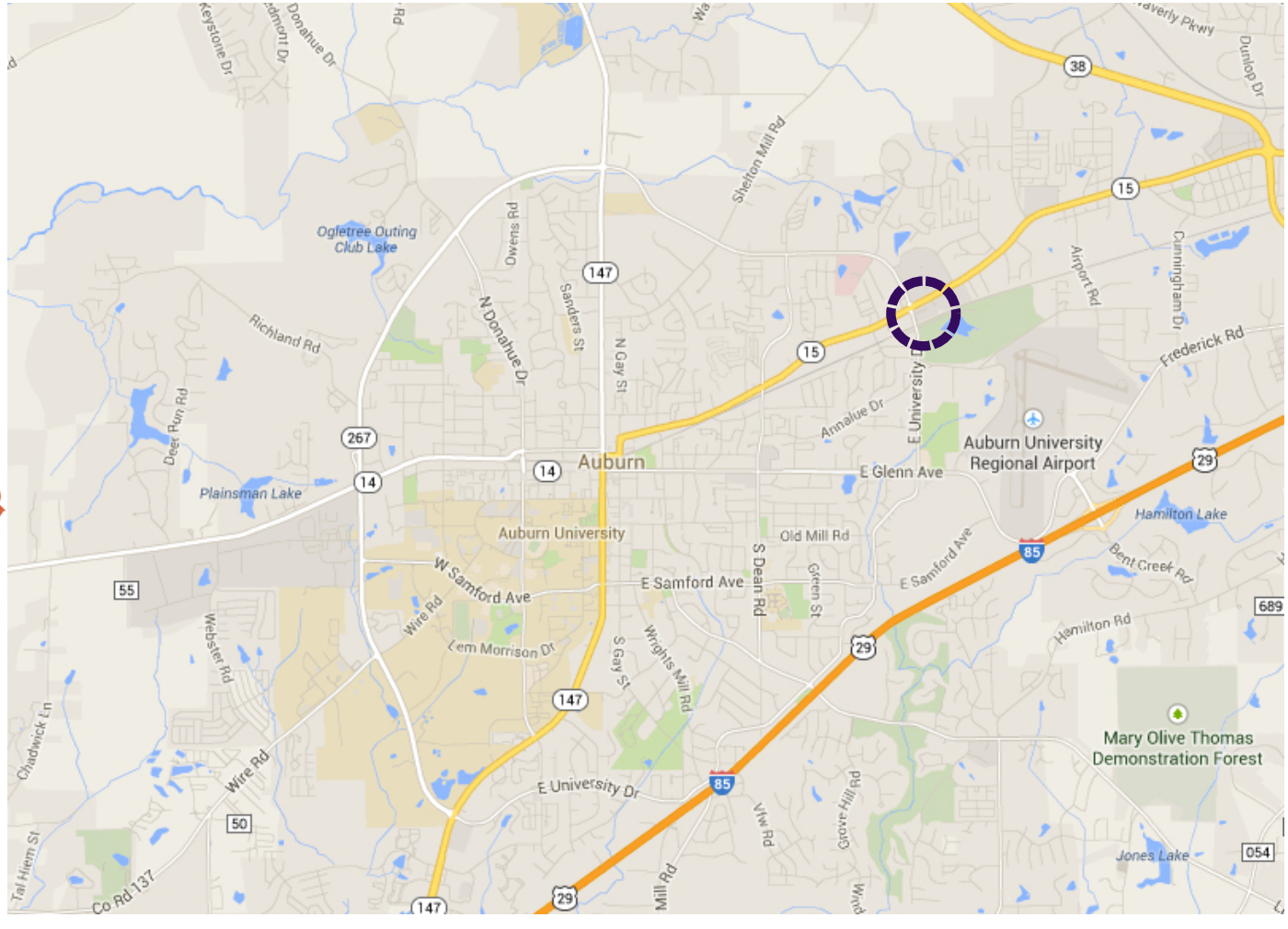
7 AM Saturday
September 20, 2013



Auburn, Alabama

Originally a territory of the Creek Indians, the land that Auburn inhabits was ceded to the United States with the signing of the Treaty of Cusseta. John J. Harper, a Methodist from Harris County Georgia, moved to the area in the 1830's establishing a church and school. The school would go through various growth stages and become what is now Auburn University. Auburn's metropolitan area growth rate recently ranks among the fastest in the United States, growing geographically from 17.16 square miles in 1970 to 56.65 miles in 2011. With this increase in geographic expansion, the Comprehensive Plan for the City of Auburn (Comp Plan 2030) calls for greater awareness for the protection of natural systems, reduction of urban sprawl, and the promotion of infill development where areas in decline could receive new investment opportunities (City of Auburn 2014).

Figure 1



Physiogaphic Regions of Alabama: Auburn, Al located in the Piedmont Upland (SP)

Auburn, Alabama is located at the fall line between the coastal plain and the piedmont plateau within the Piedmont Upland physiographic region in east central Alabama and in a unique Level IV sub-ecoregion called the Southern Outer Piedmont. The predominant soils in the area are Pacolet sandy loam, which are low in fertility and organic matter, highly acidic, and exhibit moderate permeability. Soils are good for pastureland, crop cultivation, and woodland (EOA Links 2014).

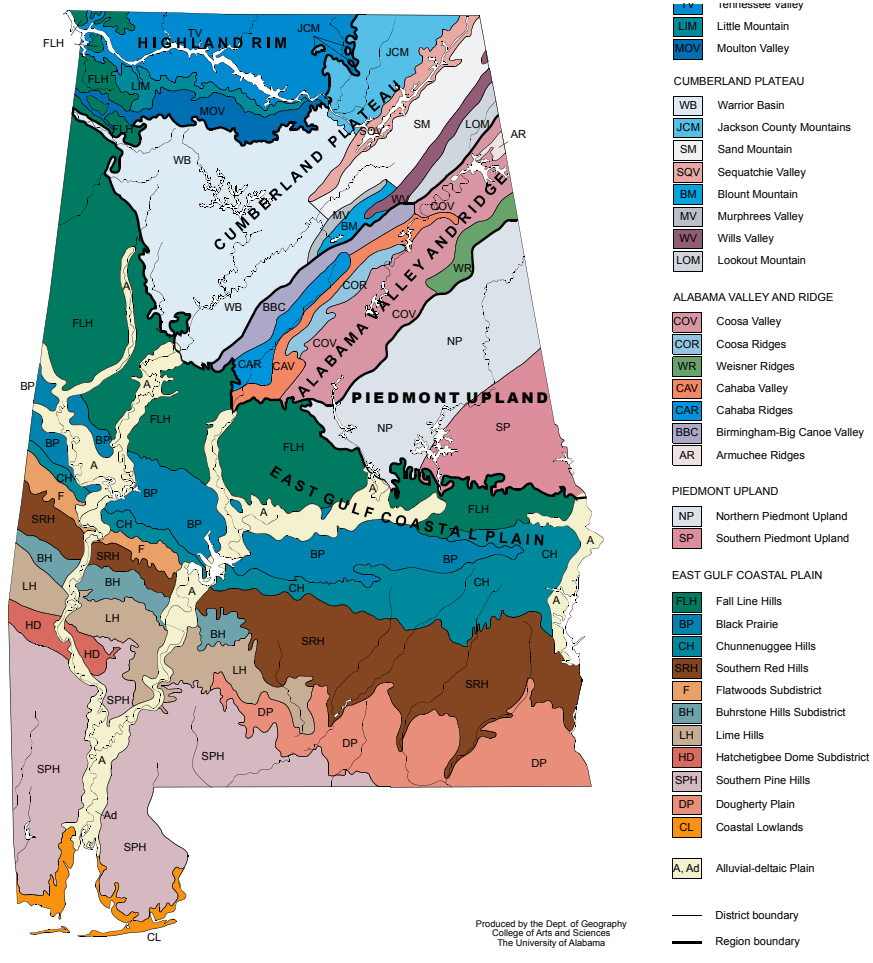
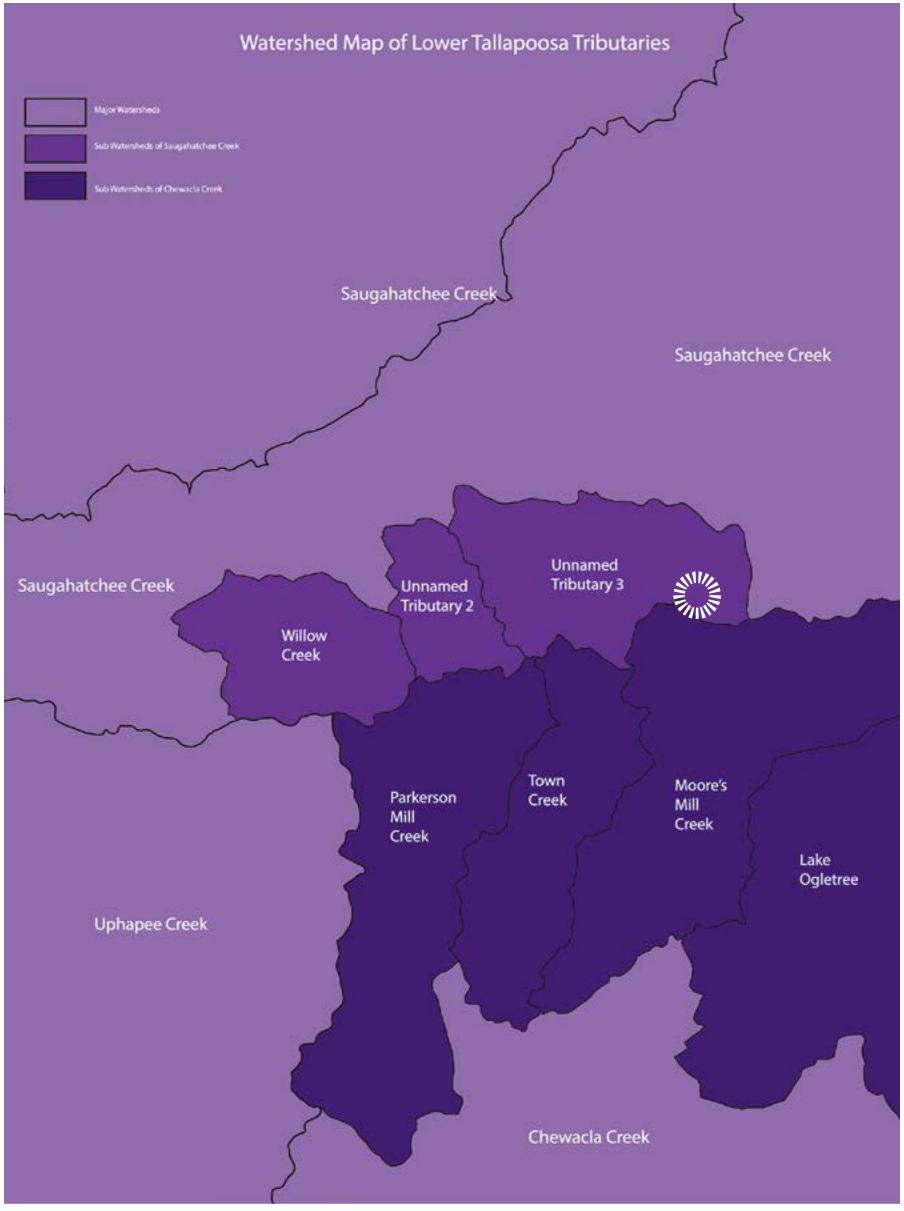
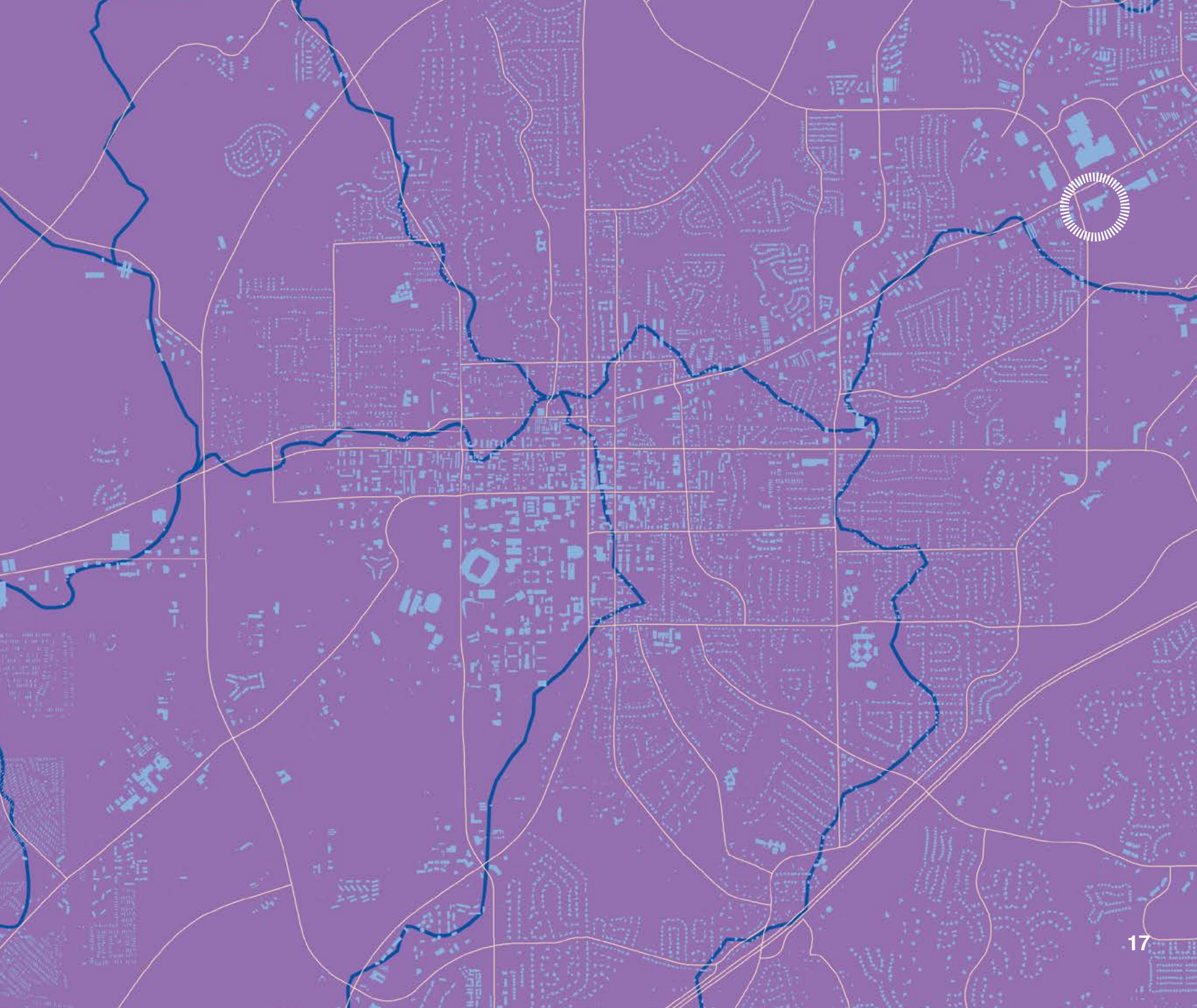


Figure 2

Local Watershed Map of Auburn, Alabama

Auburn has three major watersheds encompassing its surrounding areas, which are Chewacla, Saugahatchee, and Uphapee Creeks, which drain to the Tallapoosa River. Four smaller creeks, Parkerson Mill Creek, Town Creek, Choctafaula Creek, and Moore's Mill Creek, drain to these 3 major watersheds. Auburn's stormwater management infrastructure uses best management practices(BMP's) to control stormwater discharge. The Alabama Department of Environmental Management (ADEM) requires permits for stormwater point sources, which fall under their permit system called the National Pollutant Discharge Elimination System (NPDES). The city of Auburn is the owner and operator of a municipal separate storm sewer system (MS4), which means that the city must administer and manage its own stormwater management program (SWMP). The Water Resource Management Design and Construction Manual seeks to reduce stormwater draining off individual sites, recommending the use of bioretention/rain gardens, and stormwater wetlands. Commonly used detention and retention ponds are usually fenced off and hidden from the public. The City of Auburn is considering incentives to convert these to aesthetic areas that can be designed as public enhancement areas (City of Auburn 2014).





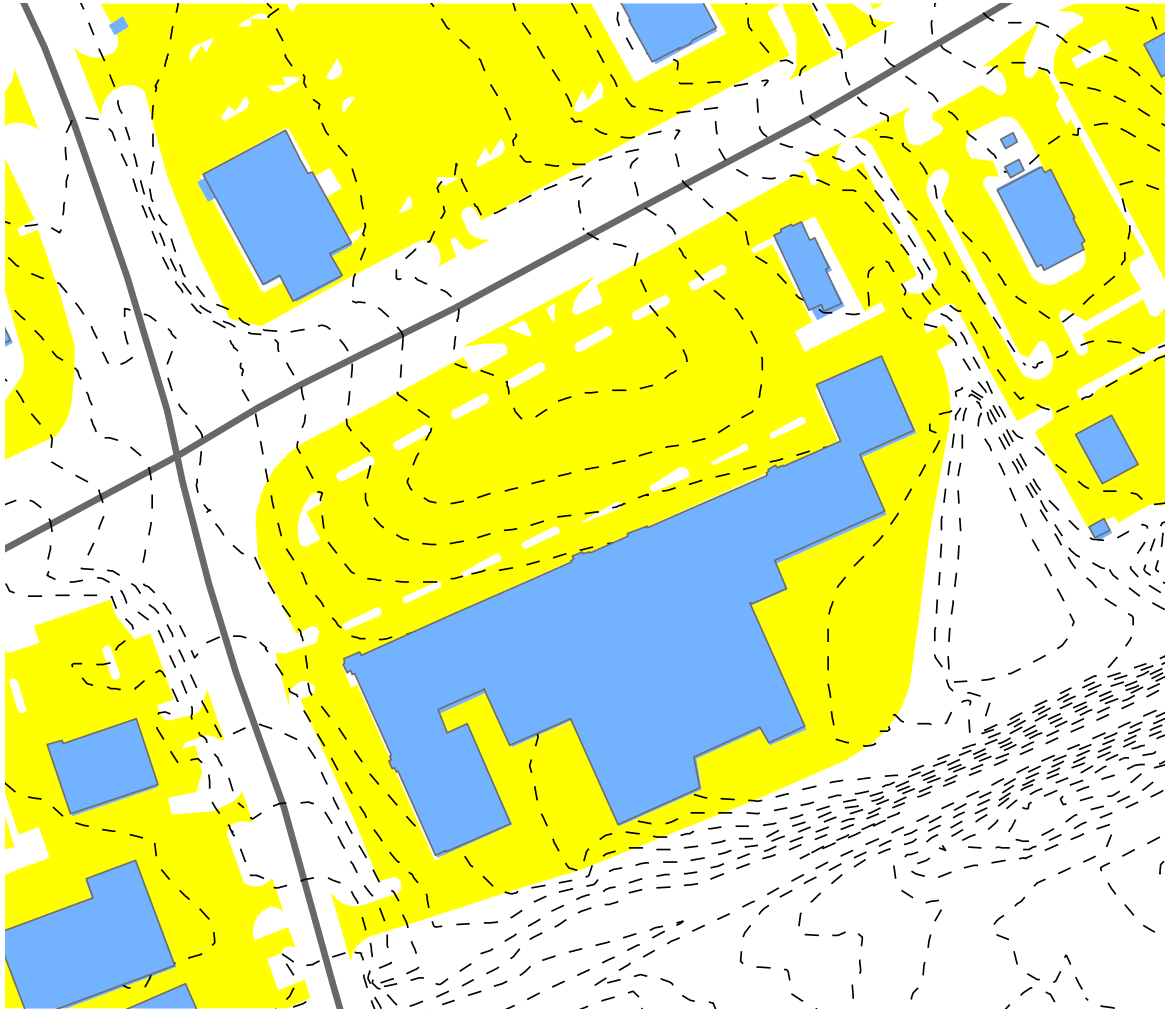
Flint's Crossing Shopping Center
Auburn/Opelika Corridor
Auburn , Alabama

Flint's Crossing Shopping Center, located at 1550 Opelika Road in Auburn, Alabama, found along the Opelika road corridor, is the site insertion area chosen for this thesis. This retail parcel is located across the street from Auburn's first and largest mall, Village Mall. This area in Auburn's Comp Plan 2030 has aspirations to become a planned corridor redevelopment area, containing both a community and neighborhood center. This area, in its currently declining condition, has lost social, economic, and ecological values. As stated in the Auburn 2030 Comp Plan, this area "sees significant traffic volumes, it suffers from high rates of vacancy, an unattractive visual environment, outdated buildings and lot configurations, an unsafe pedestrian environment, and underutilized buildings and parcels (CompPlan 3.0 Corridor Redevelopment)." It is recommended that the city invest in the infrastructure of this corridor, which is the suggested first step in all city-wide corridor investments under the Comp Plan 2030 (City of Auburn 2014).

As a start to this study of impervious surfaces and ways in which to engage design tests on the static ground plane, a popular micro mall parking lot in Auburn Alabama called Flint's Crossing Shopping Center became the primary site study. It is a unique mall, in that it is smaller in footprint and size than the Village Mall directly across Opelika Road, yet it's a much more popular destination due to its location and the draw of its diverse retail establishments including Kentucky Fried Chicken, Dental Care of Auburn, Advance America Money Gram, Southern Harvest, the UPS Store, Jewel Bank, Masters of Elegance, Kumon, Shogun Japanese Restaurant, Plato's Closet, Earth Fare, Hobby Town, Panera Bread Company, Hair Masters, the Sprint Store, Subway, Cici's Pizza, Fifth Avenue Cleaners, Glamour Nails, and a local tax and beauty supply company.

As mentioned, the Auburn Opelika economic revitalization Comp Plan 2030 has a great emphasis on this area. The languishing Village Mall directly across the street adjoins a parcel that was once a Kmart, but is currently vacant. The Carmike Wynnsong 16 movie theater and Auburn Medical Park are also located on nearby parcels. Moreover, from an economic development standpoint this is an area ripe for new attractions to stimulate the Auburn-Opelika corridor. Working within this prebuilt impervious surface infrastructure, there are unique opportunities with the ability to increase the social, economic, and ecological performance of the area.


E University Dr
Opelika Rd
AL-14
14
Ronald Ln
1825
1091
1999
Country Club D



Site Topography

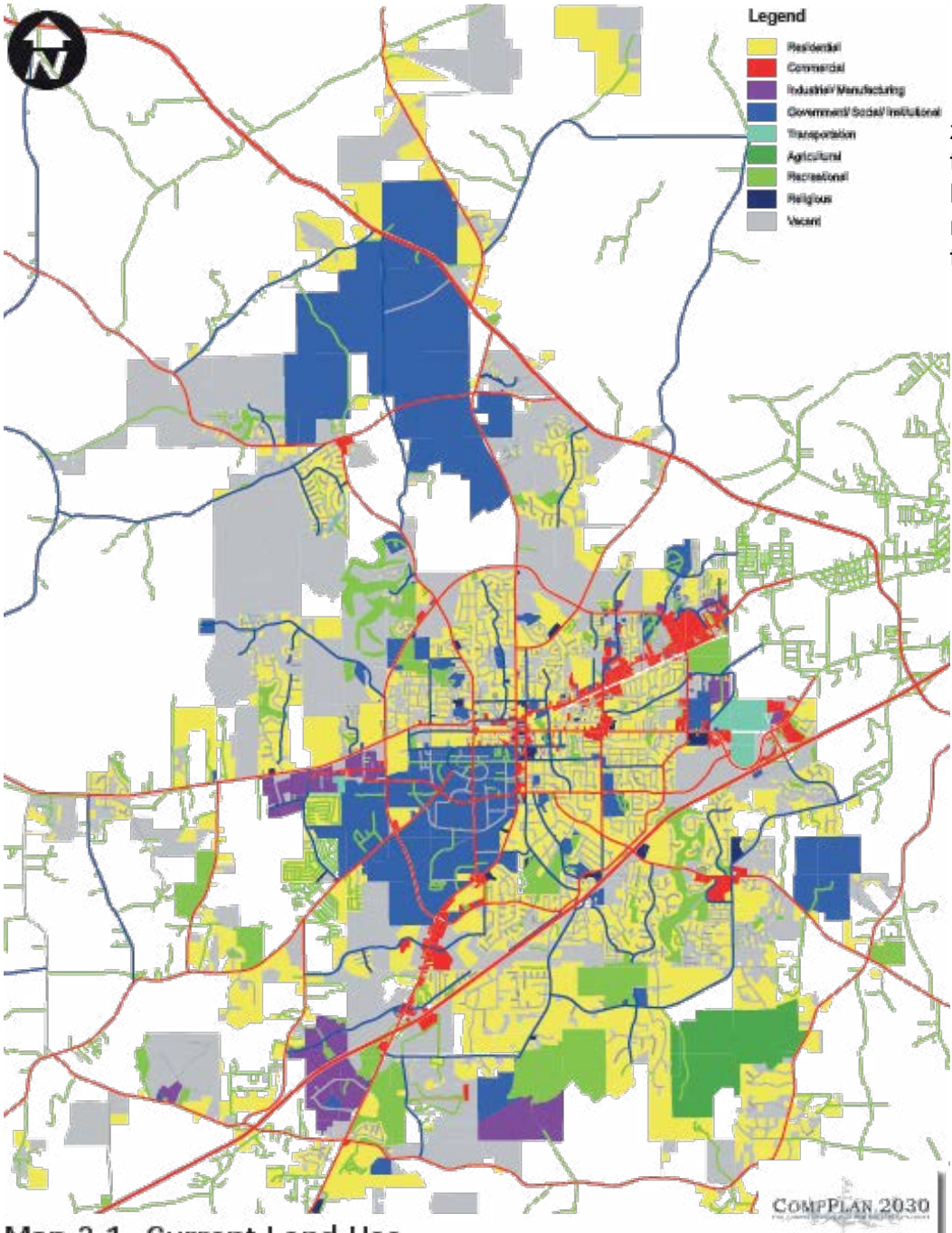
Site elevation is 712 feet at the lowest part of the basin at Opelika Road and rises up to 720 at the shopping center entrance. Its western edge has a high point of 724 feet and its eastern edge 716 feet in elevation.

Site Hydrology

Flint's Crossing's border to Opelika Road is the low point of the area. An old piped creek bed runs from southeast to northwest from Sougahatchee Lake across the railroad tracks, where it crosses Flint's Crossing and continues across Opelika road through the Colonial Mall's westernmost site boundary. Elevation at this physical depression is 712'. The bottom of Flint's Crossing Shopping Center is the low point that collects water from all four sides.

Current Land Use

Flint's Creek Shopping Center is zoned as a commercial district. It is bordered to the south by a recreational area, vacant land and commercial to the north and east, residential on all sides, and arterial roads on the north and east.



Map 3.1: Current Land Use

Figure 3

Future Land Use

Land Use goals of the 2030 Comp Plan include developing areas that have fallen to decline; develop mixed use centers that are not centered around the automobile and cater to local neighborhood residents; provide alternate forms of transportation including bus, pedestrian and bicycle transportation; and provide more multi-family and mixed-use areas (City of Auburn 2014).

The area in and around Flint's Creek Shopping Center is ripe for redevopment. Both a neighborhod and community center are planned for this area, to attain the goals listed above (City of Auburn 2014).

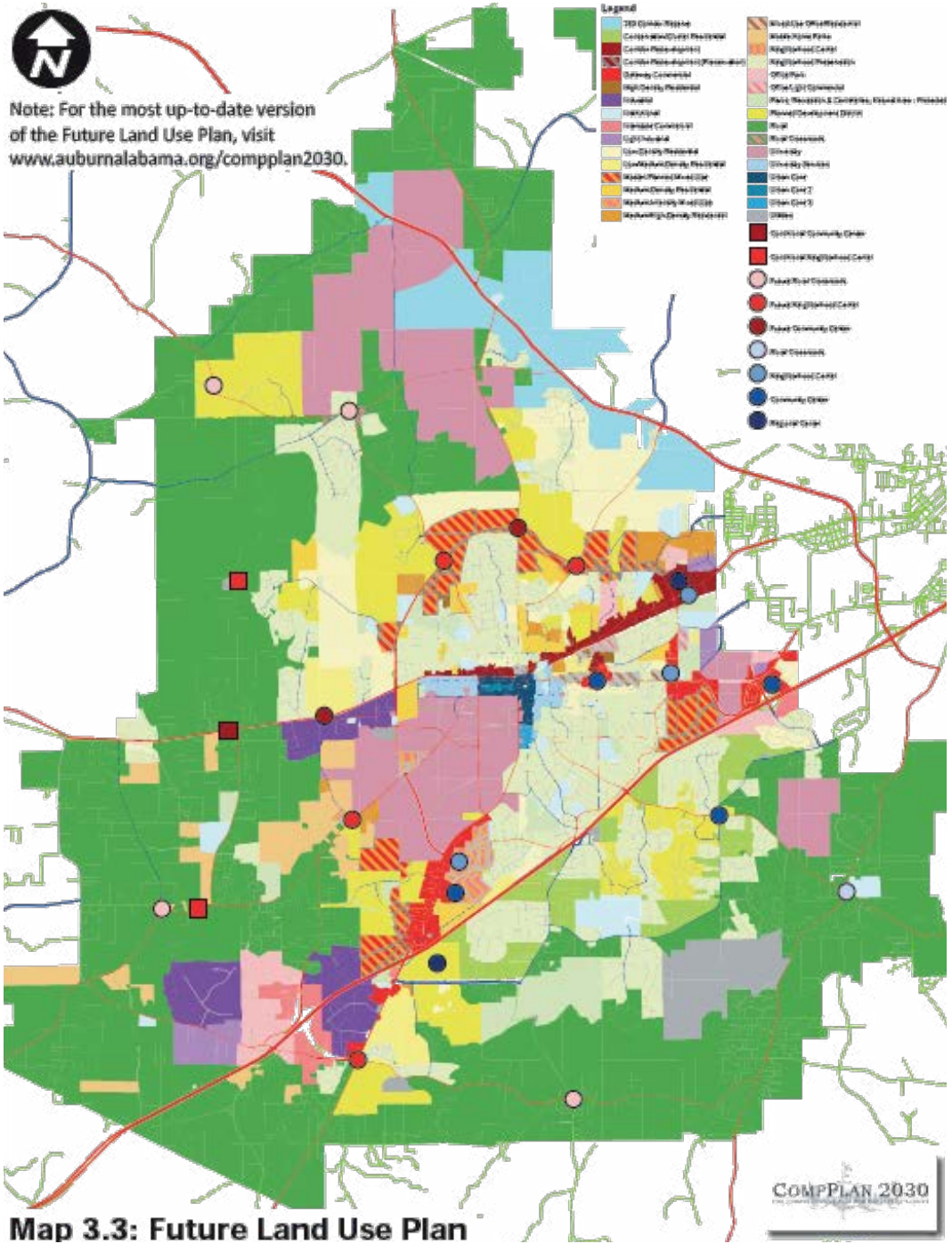
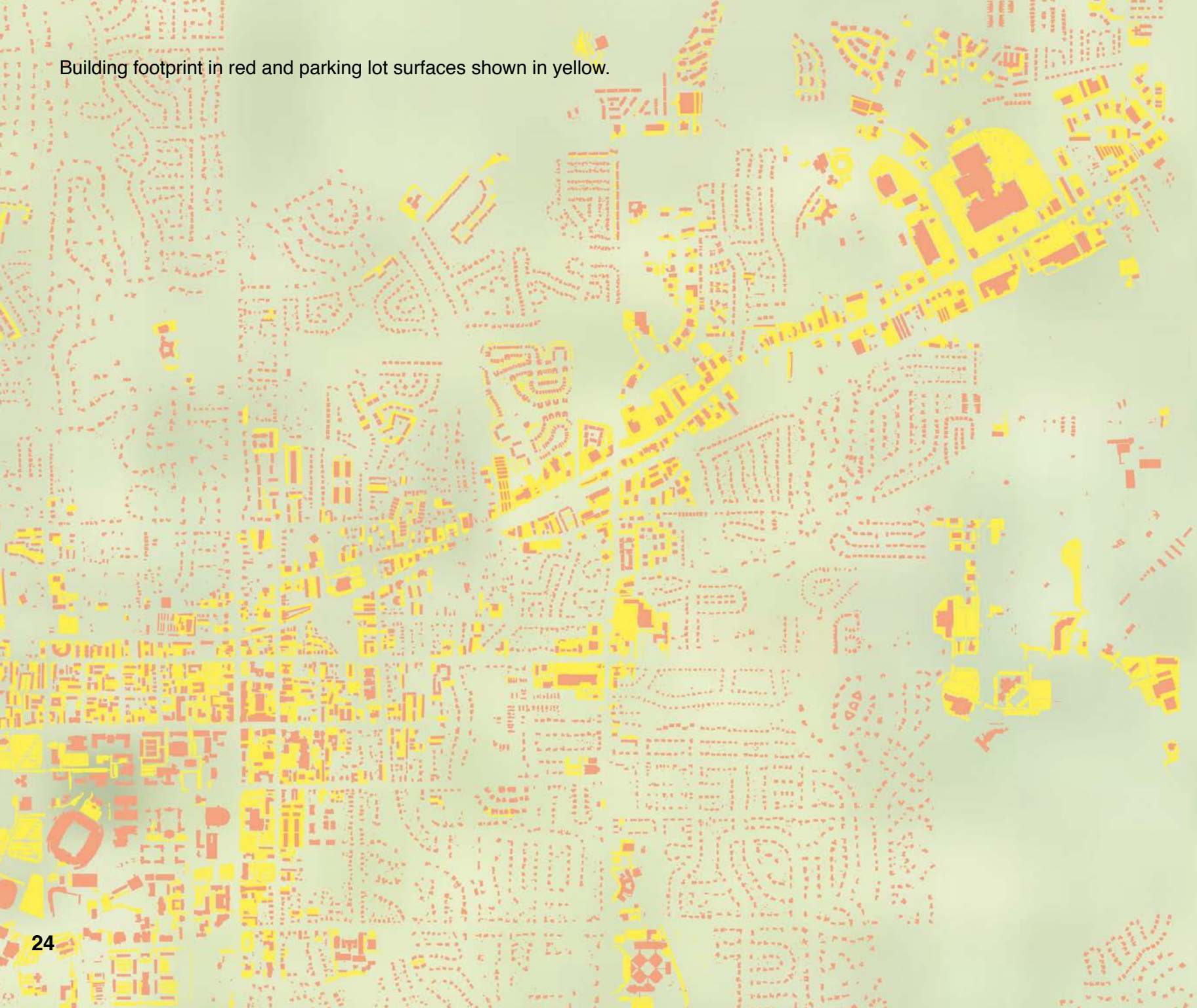


Figure 4



Building footprint in red and parking lot surfaces shown in yellow.

The Urban Surface Adaptation concept takes into consideration the idea of promoting social, economic, and environmental improvements to static impervious surfaces that have declined in use and function.

Impervious urban surfaces can be adapted under the right conditions and through strategic operations.

These insertions are inspired by specific existing conditions of a chosen site.

playing chess

9:50 AM Saturday
October 11, 2013

Playing Chess

During the initial explorations into this thesis design process, the author disliked the parking lot for its social, economic, and ecological shortcomings, without considering its success as performative space for circulation and temporary storage for vehicles. But having spent hours setting up chairs in the hot summer sun in downtown Richmond, VA as a child at arts festivals, the author had reason enough to see the negative aspects in these barren heat deserts. Parking lot designs have not changed much since their invention. Before moving forward through design explorations, the author had to understand and embrace parking lots and their design for the successful facilitation of parking, moving, and temporarily storing vehicles.

The first design drawings showcased different ways to make parking lots more of a social experience, to the extent that people might actually use or think of them as small parks. A parking lot has a personality that can be seen from the exterior of its borders. A person's approach, arrival, maneuvering experience, ability to find a space, and later exit were important considerations throughout the design process.

The intent with these first iterations was to create green spaces where weekend events such as cook-outs, tail-gates, farmers markets, and etc. could occur. For pedestrians, these spaces offered safe areas for social and economic activities. It was important to make sure that these areas contained enough space so that the soil volumes could allow for large trees to grow over time into their normal mature sizes, providing cooler more comfortable microclimates. The way in which the stall and drive lane configurations were experimentally designed was reminiscent of playing chess and moving around board pieces.

Case Study: Herman Miller Factory
Cherokee County, GA
Michael Van Valkenburg & Associates

This site was a manufacturing plant for Herman Miller. Michael Van Valkenburgh used a place-making strategy that was designed primarily to protect local ecosystems along the Etowah River. Careful attention was placed on the ritual of the daily employee entry and exit to and from the facility (Michael Van Valkenburgh Associates, Inc 2014).

Takeaway:
-the importance of ritual in parking culture
-site specific details should influence design

Figure 5

Figure 5

Figure 5

Case Study: Dia Art Museum
Beacon, NY
Robert Irwin

Figure 6

Robert Irwin designed Dia Arts grounds in a way that showcases the environmental qualities of the place as well as engages the user experience (Robert Irwin 2014).

Takeaway:
-engage user awareness of site qualities
-eco-revelatory design to provoke inquiry

Figure 6

Figure 6

Case Study: Fiat Lingotto Factory
Turin, Italy
Renzo Piano

Renzo Piano redeveloped an old Fiat automobile factory into a mixed-use center. The parking lot was designed to take into account the cultural and social dimension of the parking experience (Lingotto Factory Conversion 2014).

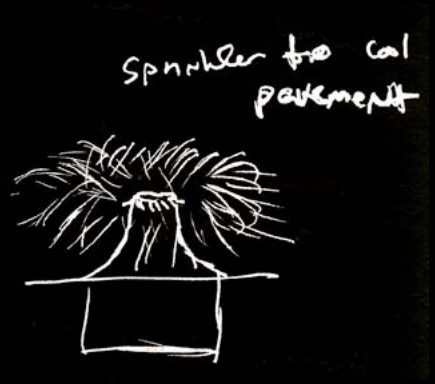
Takeaway
-democratic public space welcoming pedestrians as equally as it does vehicles
-improving the perception of a parking lot's sterile surface

Figure 7

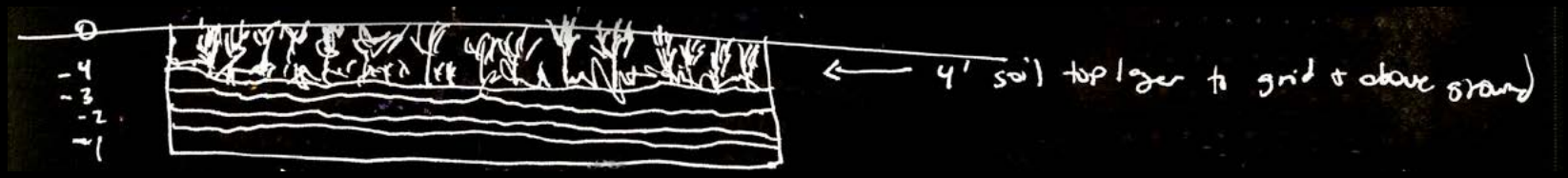
Figure 7

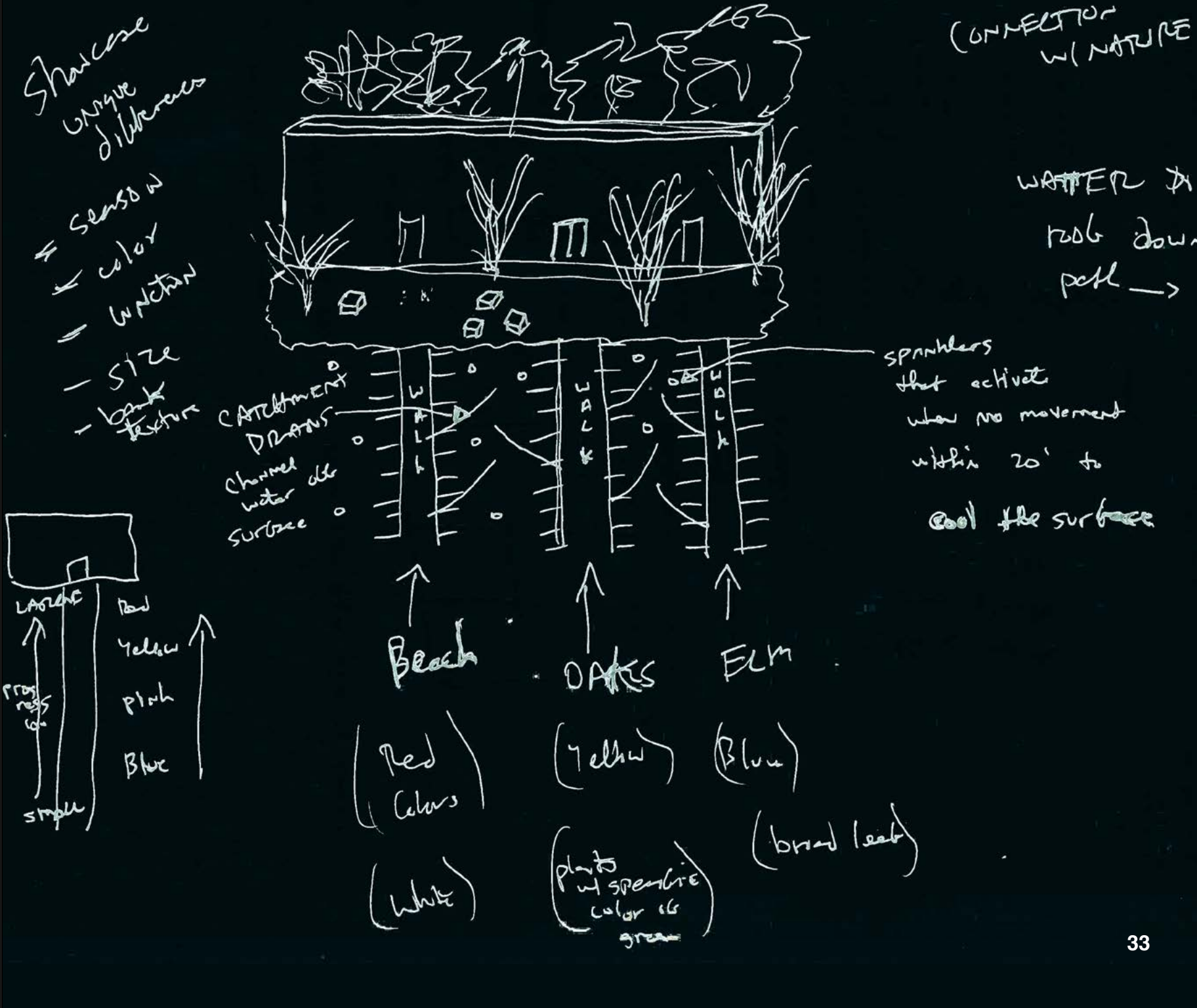
Figure 7

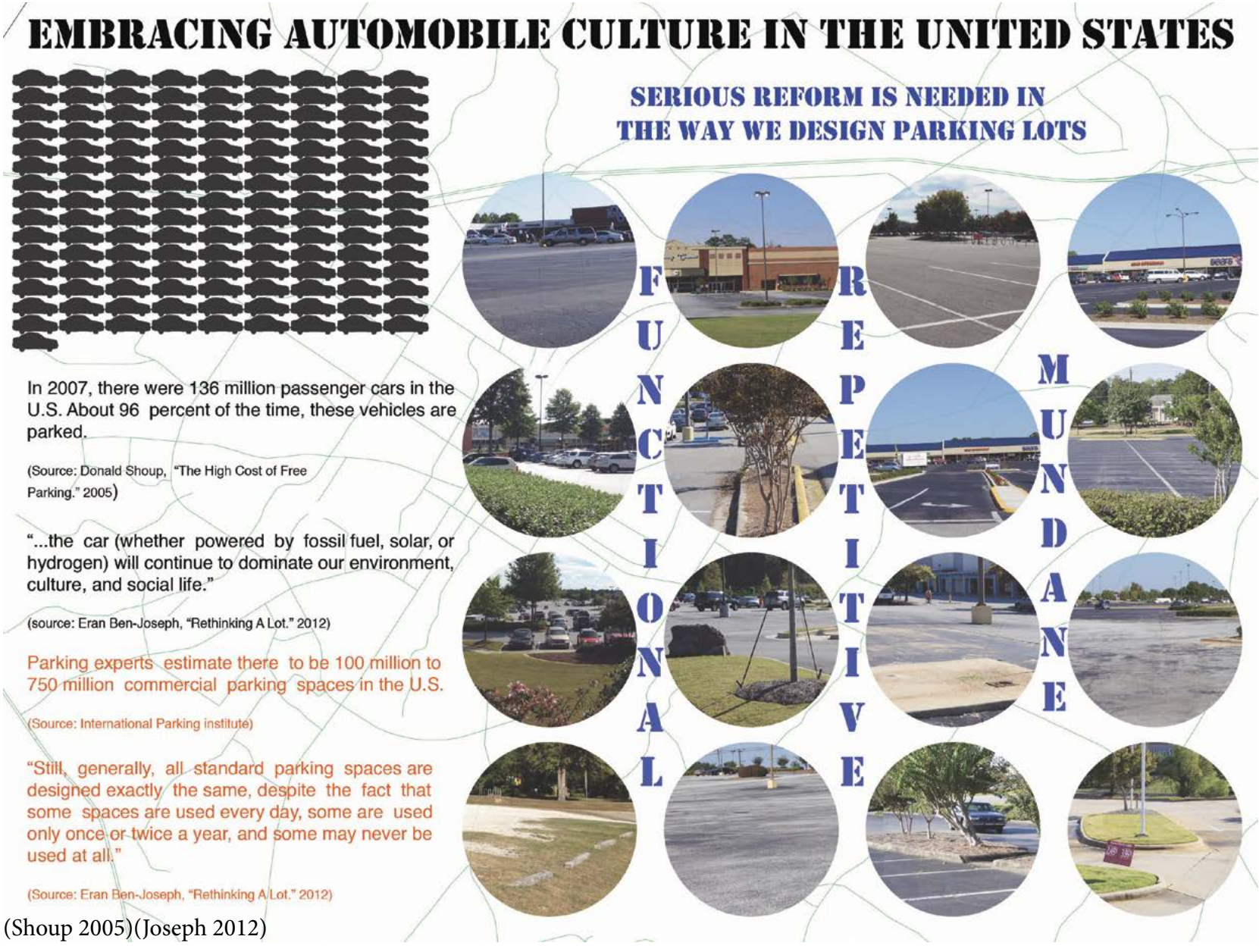
Early Design Ideas



Sub terranian shade plants



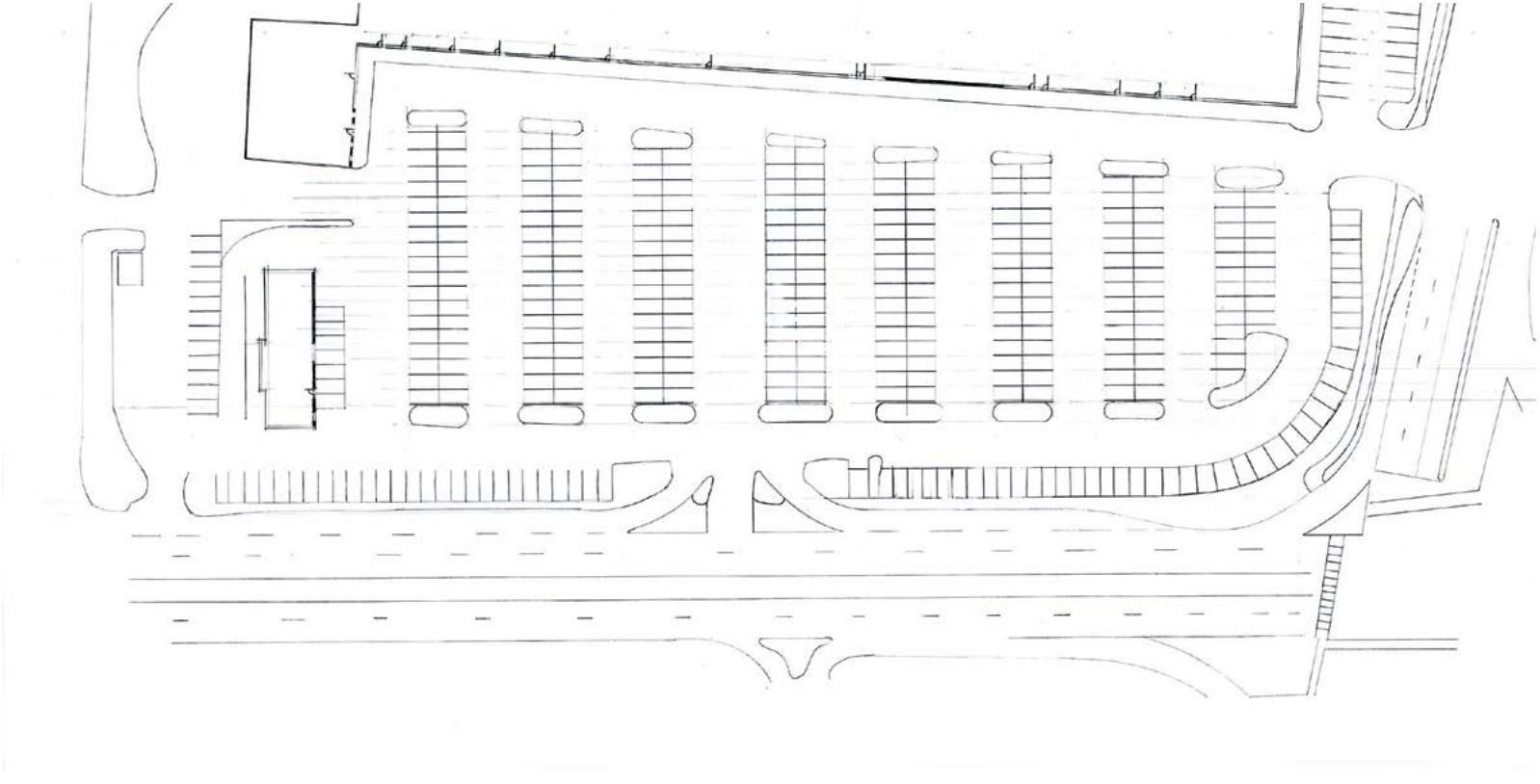

Showcase
unique differences
= season
= color
= function
= size
= bark texture
CONNECTION w/ NATURE
WATER
rock down path
CATCHMENT DRAINS
Channel water off surface
WALK
WALK
WALK
sprinklers that activate when no movement within 20' to cool the surface
LADDER
Red
Yellow
Pink
Blue
Beach
OAKS
ELM
(Red Colors)
(Yellow)
(Blue)
(broad leaf)
(white)
(plants w/ specific color & green)
33



(Shoup 2005)(Joseph 2012)

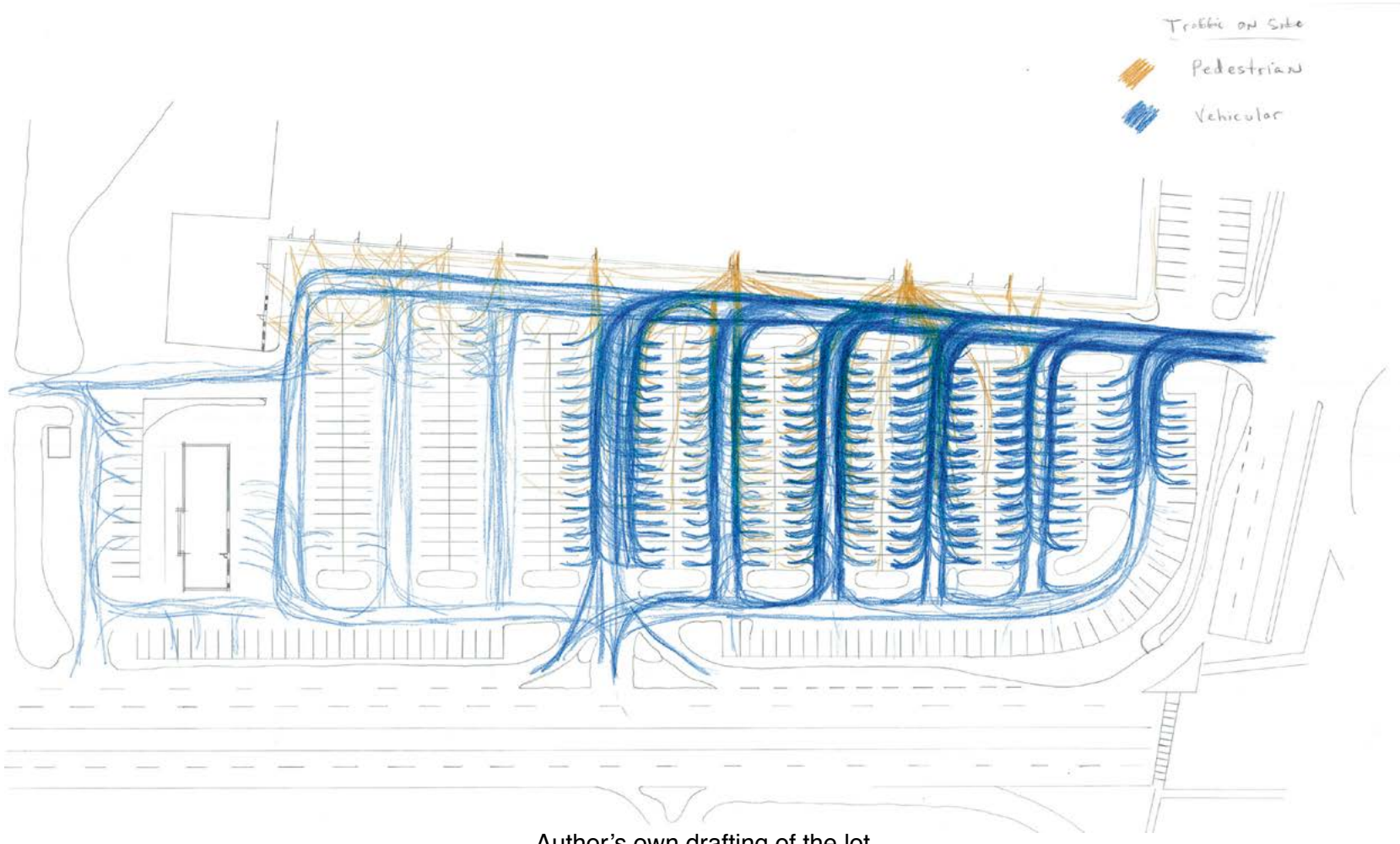
An early study of multiple parking lots around Auburn, Alabama found similarities in layout, ground materials, and priority given to vehicles.

Flint's Crosssing Parking Configuration



Hand drafting the lot to understand its parking stall layout and number of spaces, spatial arrangment, relationship site buildings, and other existing conditions for potential design considerations.

Pedestrian and Vehicular Circulation



Author's own drafting of the lot

Popularity

The pedestrian and vehicular circulation diagram was completed after multiple site visits. The shopping center thrives with various retail outlets. Panera Bread and Earth Fare are the two largest and busiest retailers. This photograph paints a picture of the popularity of those two establishments, which are located on the right half of the shopping center where the vehicles are parked. People prefer a convenient parking space with a quick walk to their destination. By understanding the businesses on-site and their popularity, the intent was to understand how a redesign could occur most successfully.

Figure 8

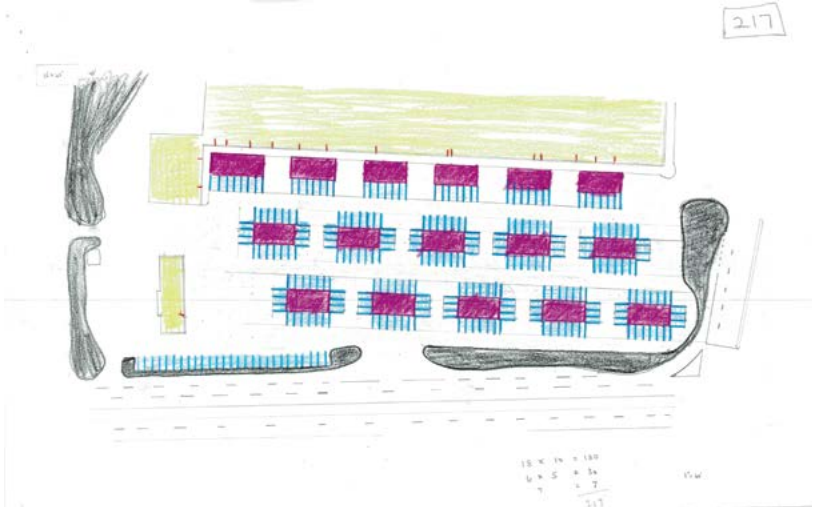
Design Iterations 1 & 2

Pedestrian Islands

-325 parking spaces
-provide pedestrian areas with seating, shade trees, and social areas
-take as few parking spaces away as possible from original design

Takeaway

-provide a pedestrian area where vehicles cannot encroach to increase the social value of the parking lot



Green Space

-217 parking spaces
-provide larger islands where shade trees have ample soil volume to reach full size
-provide shaded microclimates
-provide areas for mutliple uses throughout the seasons, such as farmers markets
-avoid reducing too many parking spots from the original design

Takeaway

-fewer and larger central spaces more successful
-seeking unique design differentiating the lot from others

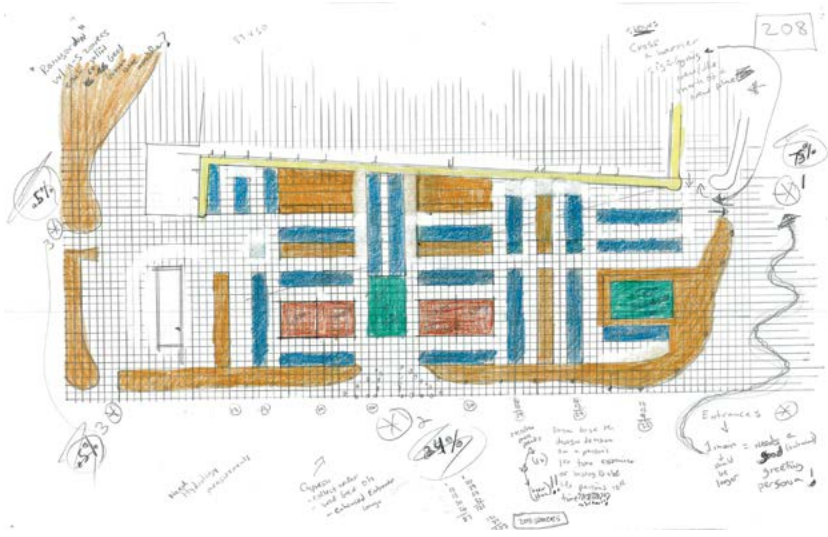
Design Iterations 3 & 4

Rain Gardens/Basketball

-208 parking spaces in blue
-beginning to dedicate more space for ecological and social areas in orange
-integrate basketball court for use when few cars are parked

Takeaway

-think more about hydrology and water retention on-site
-think of other social events that could happen here

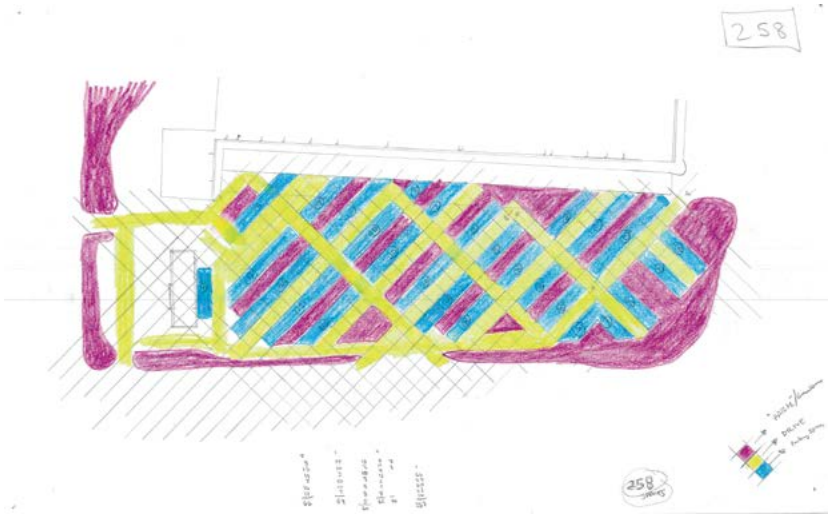


Maneuverability

-258 parking spaces
-greenspace (pink)
-drive lane in yellow
-parking spaces (blue)

Takeaway

-diagonal drive lanes increases time looking for a parking spot and might increase risk of car and pedestrian accidents



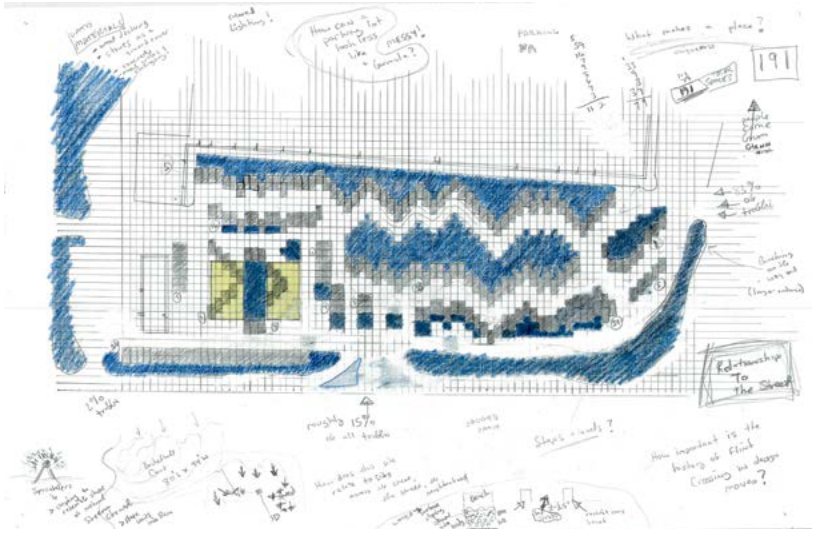
Design Iterations 5 & 6

Messy Formula 1

-191 spaces
-more winding non-formulaic circulation movement for vehicles
-dedicated areas for events (blue)
-basketball court

Takeaway

-unsafe circulation pattern

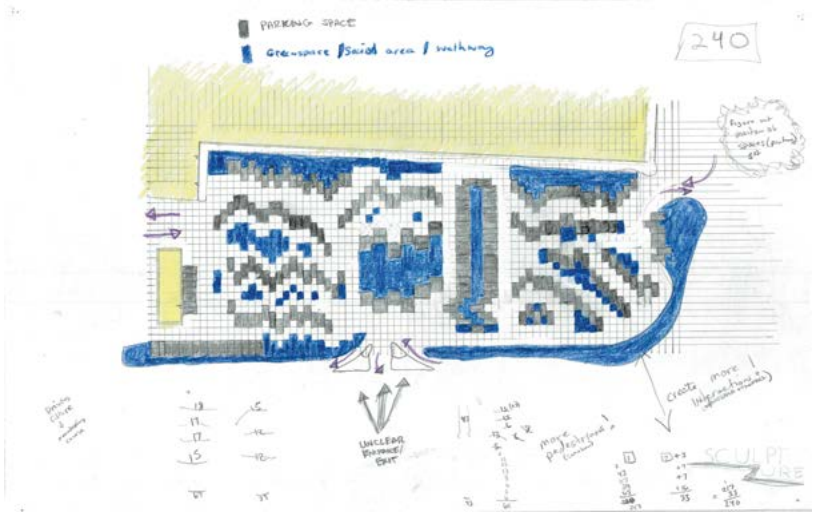


Messy Formula 2

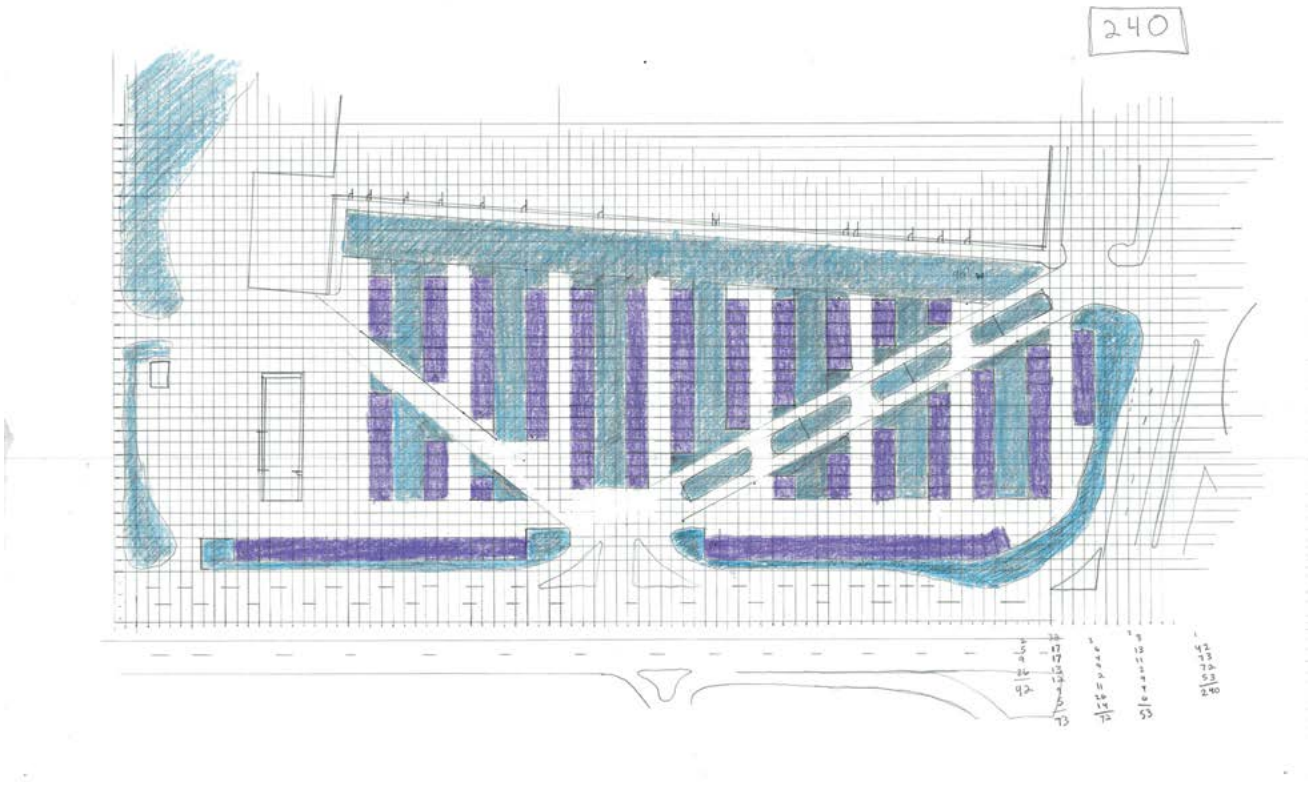
-240 spaces
-pedestrian social spaces (blue)
-central space for larger events
-provides unique spatial arrangement to attract attention

Takeaway

-lack of cohesive pedestrian areas
-dangerous circulation patterns for vehicles
-too much wasted space reduces the number of parking spaces



Design Iteration 7



This final circulation design leads to the next chapter and the Islamic Garden concept.

islamic garden

6:30 PM Thursday
October 16, 2013

Islamic Garden

Research for this thesis research included looking at historical landscape designs. Islamic gardens provided an interesting study in place-making, and inspired the inclusion of water in the parking lot design. Dating back thousands of years, Islamic rulers' walled pleasure gardens placed great emphasis on water and its soothing, cooling effects on a court population surrounded by hot, desert-like landscape. Water was delivered in trenches dug from mountains above, and often many miles away, to walled gardens where water's sound, reflective qualities, and cooling effect created lush green habitats (Rogers 2001). How could water be incorporated in the design for Flint's Crossing so that it created beauty and was not just a waste product?

Parking lots and other impervious surfaces are engineered through formulas to sheet water off the surface for safety reasons. Water from storm events lands on the hard surfaces and sheets quickly away from vehicular traffic and into storm drains, which are piped into nearby streams. When the water leaving these drains pours into nearby creek and river systems, all sorts of problems can occur. Depending on the scale of rain event, erosion of sediment and stream channels may occur, which destroys natural habitats for fish and invertebrate species. Water rushing off hot impervious surfaces can also reduce the amount of oxygen in the water and heat up stream or river temperatures, thus changing the normal habitat for riparian species. Taking all the above into consideration, and having calculated the waste water on the Flint's Crossing surface, this determined the final design and size of the subterranean spaces (Karavonen 2011).

Case Study: Historic Fourth Ward Park
Atlanta, GA
HDR, INC.

HDR designed this as a multifunctioning space to perform as a retention facility, an event space, community greenspace, an economic development armature. It saved the city $15M in stormwater facilities (Historic Fourth Ward Park).

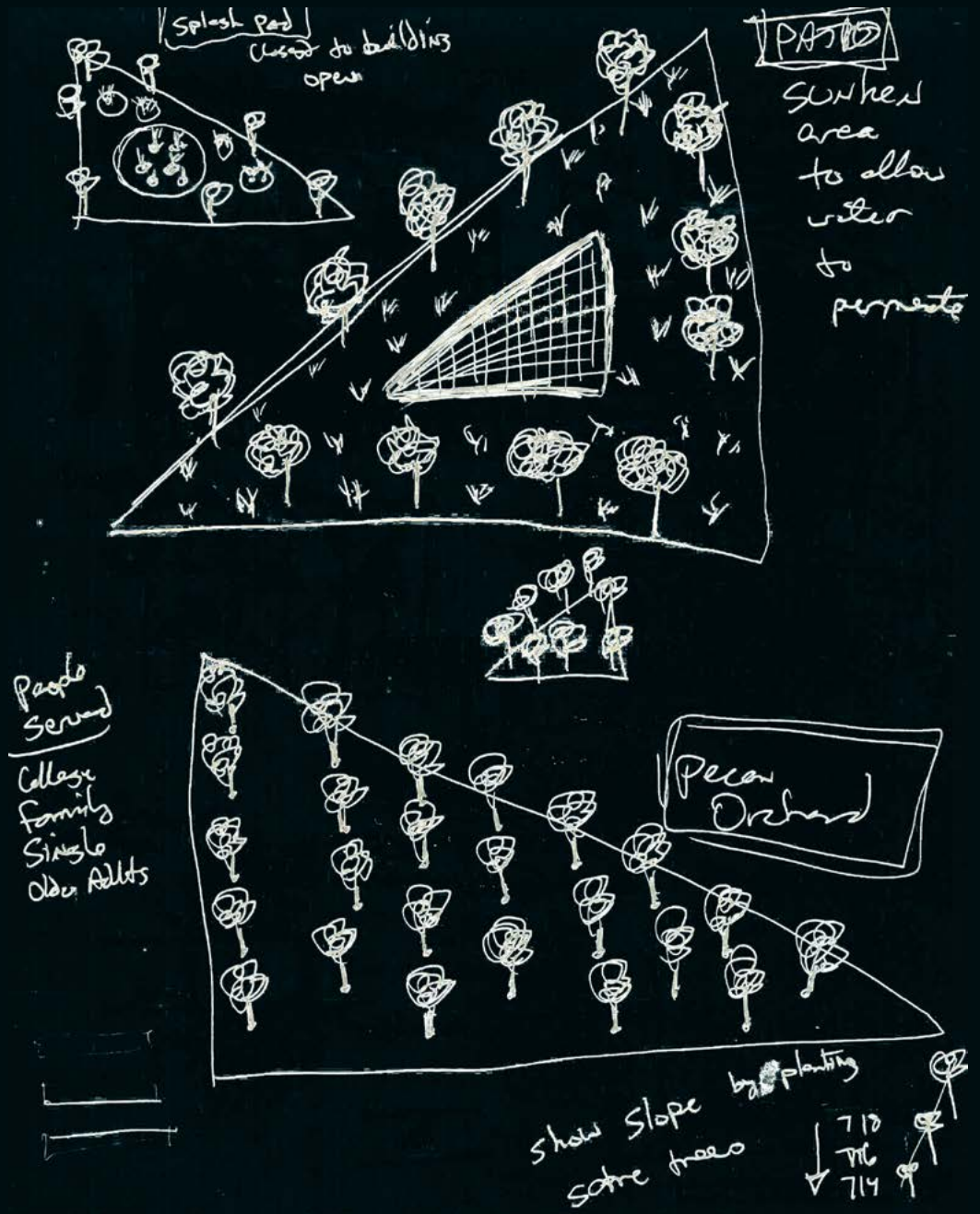
Takeaway
-celebrates water as a precious resource
-an enclosed embedded space
-catalyst for revitalization

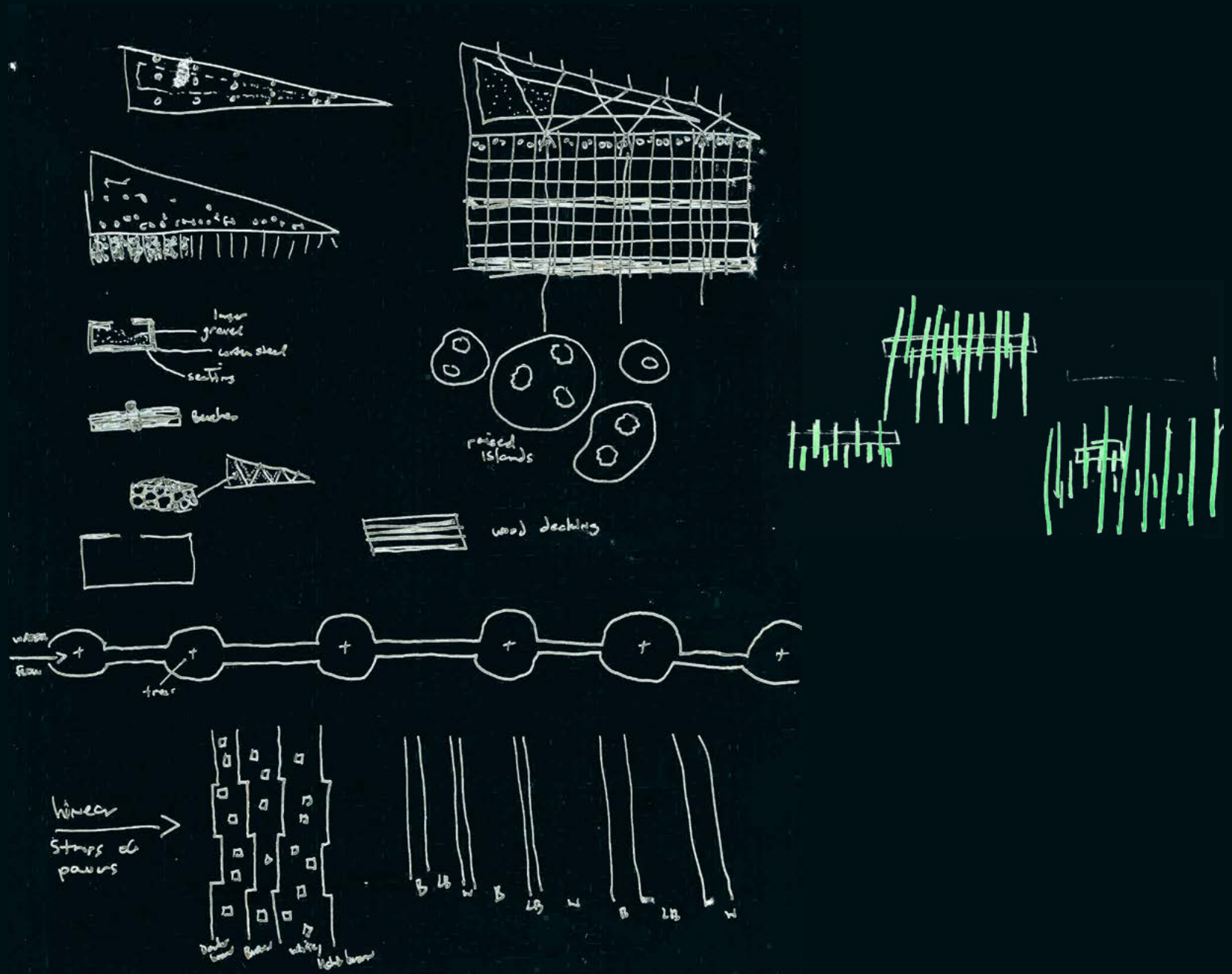
Figure 9

Figure 9

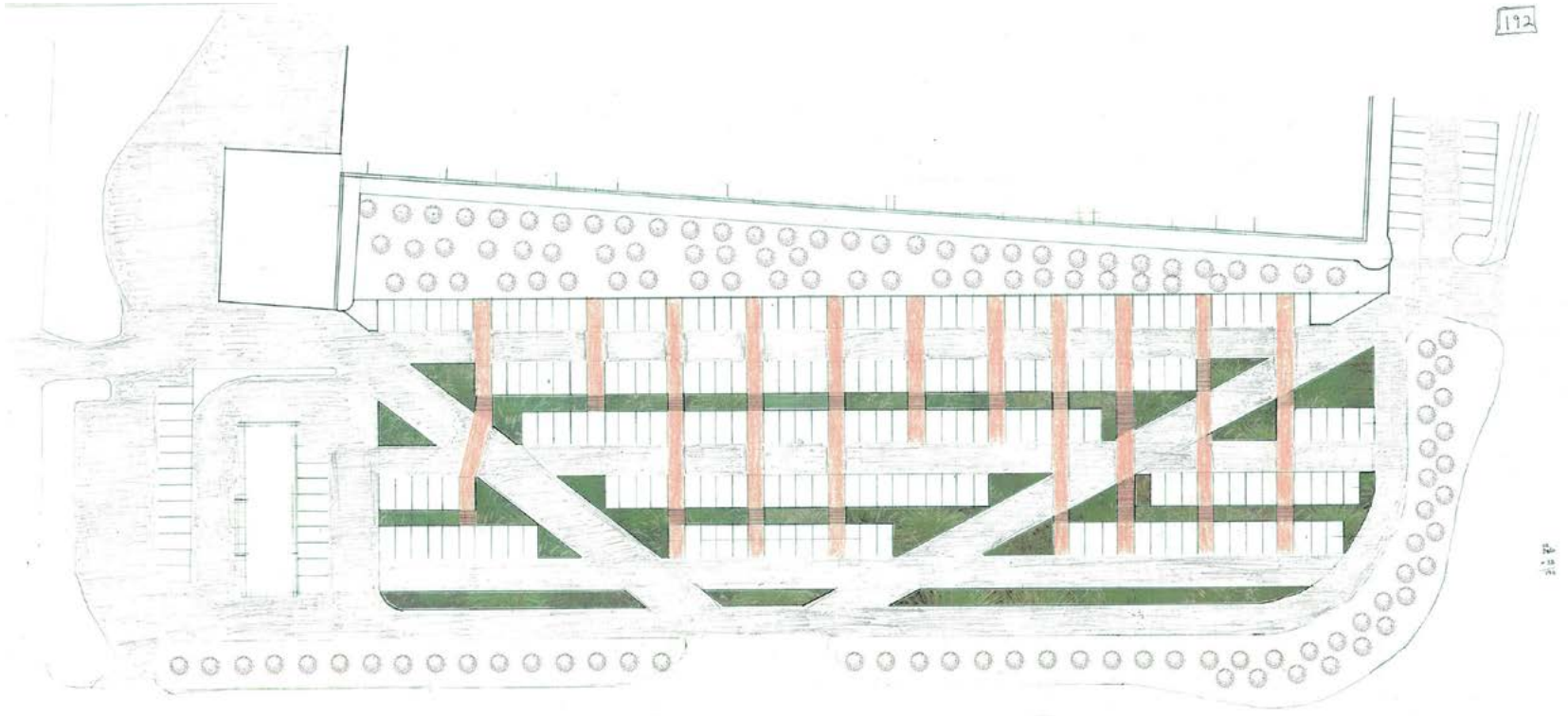
Figure 9

Early Design Ideas




larger gravel
sealing
benches
raised islands
wood decking
water flow
trees
linear steps & pavers

Islamic Garden Design Iteration 1

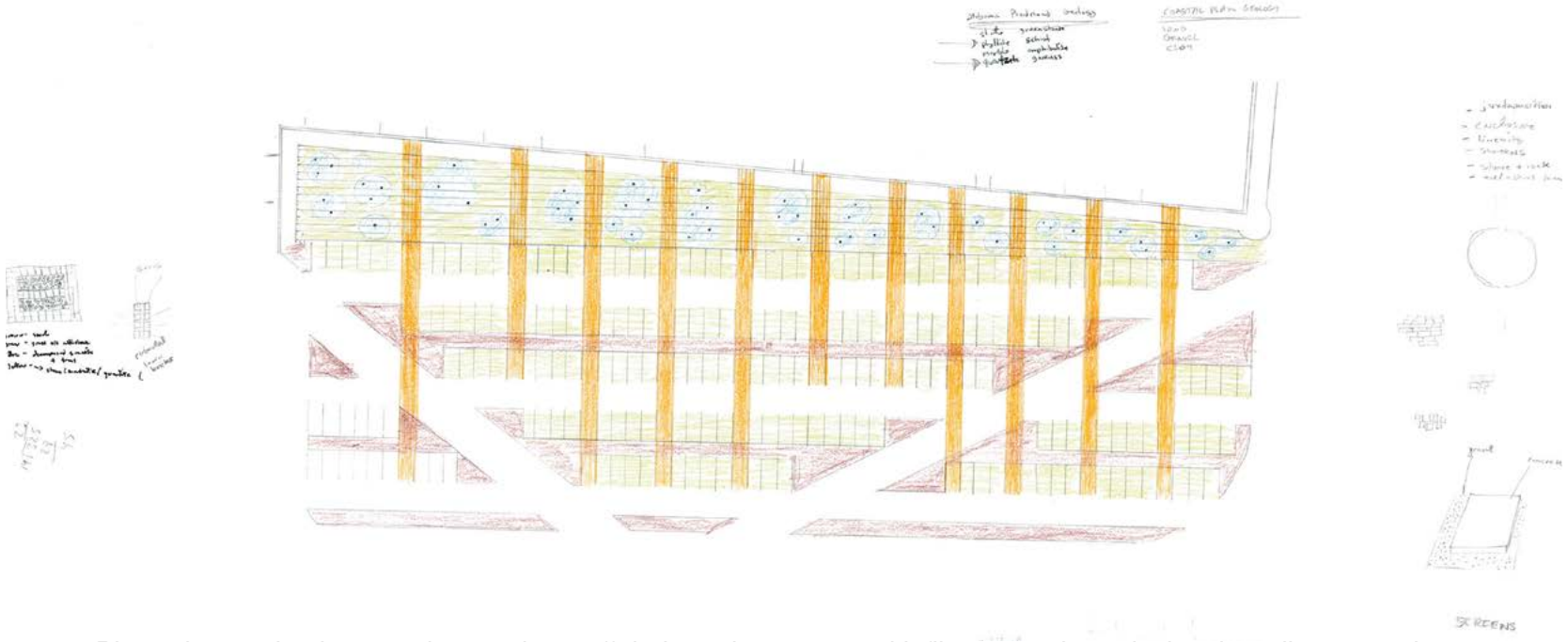


Tulip poplar trees are planted around the edges of the site to represent the enclosure of Islamic gardens. From outside the property, pedestrians or passing vehicles would be able to see through to the inner space, perhaps noticing the unique spatial quality of a tightly woven wall of trees encircling the innner lot.

Taller sycamore trees are planted within and around 30 feet of the building, so that there is a shaded microclimate for shopping center guests to sit, walk, talk, and people-watch. The difference in tree species would offer a variety of ephemeral qualities. Bark texture would be spotted white and tan in the case of the sycamore and deeply furrowed in the tulip poplar. Both have broad leaves offering different shapes and colors, unique flowering structures, contrasting growth rates, and simlar fall color.

Inside the parking area are pedestrian lined walkways, which are made of different textures than the drive and parking surfaces to build safety into the parking format.

Islamic Garden Design Iteration 2

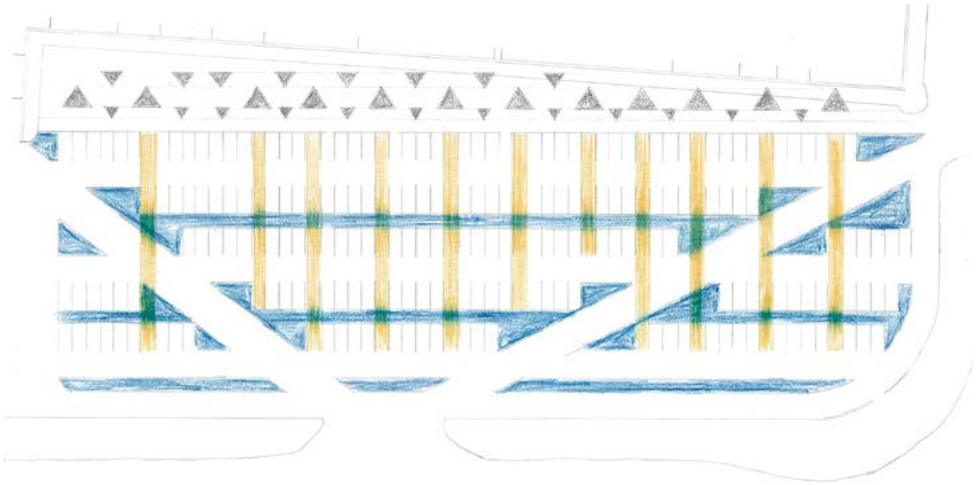


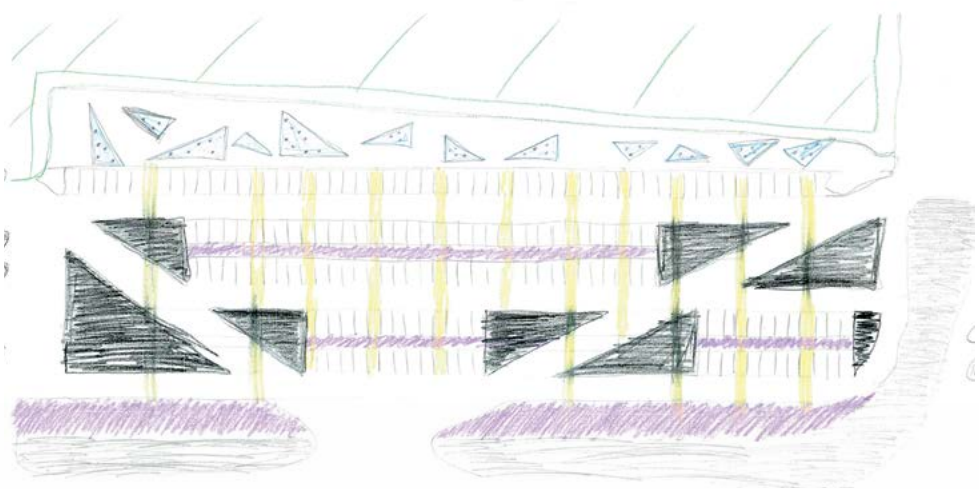
Bioswales are implemented to catch runoff during rain events and infiltrate on-site reducing the reliance on city storm-water infrastructure. The bioswales have hydric, mesic, and xeric zones, which are lined with varying plant species, all of which offer various differences in ephemerality and seasonality. In creating bioswales, the goal is to provide enticing habitat for plants, animals, insects, and people.

Round garden spaces near the main building were added, some of which are sunken a few feet and some at grade. Each has either seating areas or planted areas. Materials become important in these design decisions to break up aesthetic monotony. Parking lots are usually unbroken monolithic surfaces. Using varying surface materials to indicate unique purposes offers more compelling surface design. The areas where cars circulated in and out were designed with pervious asphalt, which offers greater water infiltration and runoff.

Cobble-stone parking areas would allow increased infiltration of water, as well as signal through the use of texture and tactile experience a different kind of use. The pedestrian walking areas offered another different texture and color to indicate their specific purpose for foot traffic and slow zones for cars. Wooden bridges offered another varying texture to cross over the bioswales. All these different textures and colors of the surface material increase the visual and tactile sensory experience of visitors.

Islamic Garden Design Iteration 3 & 4



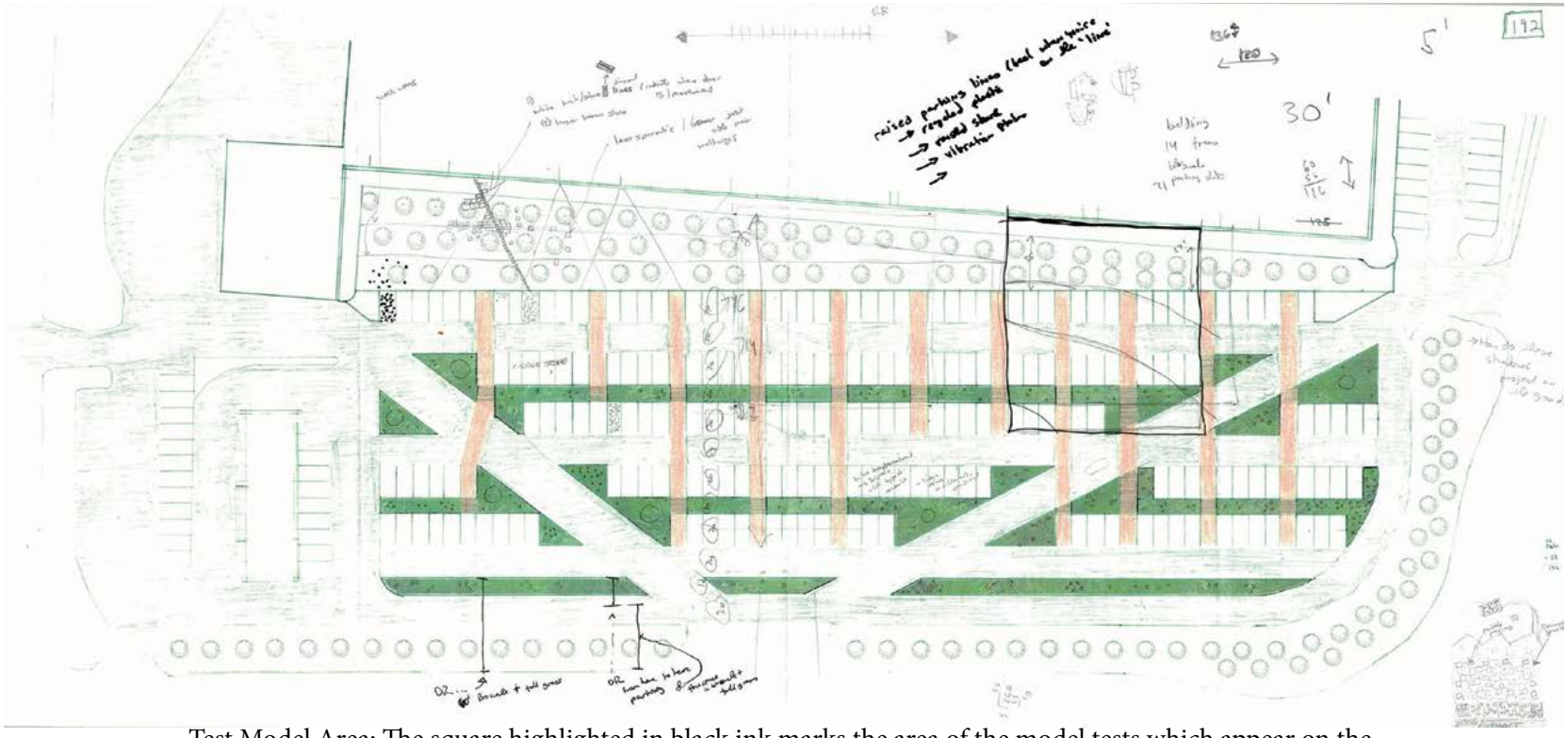


The round garden created in the last design iteration changed to triangular spaces to give geometric cohesion to the overall design.

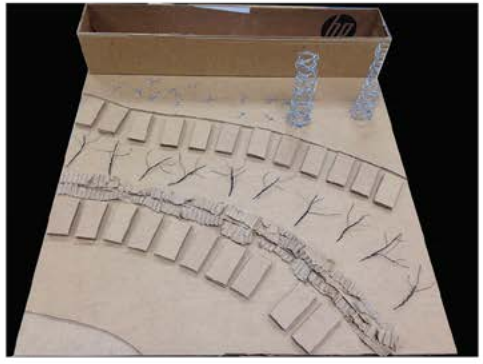
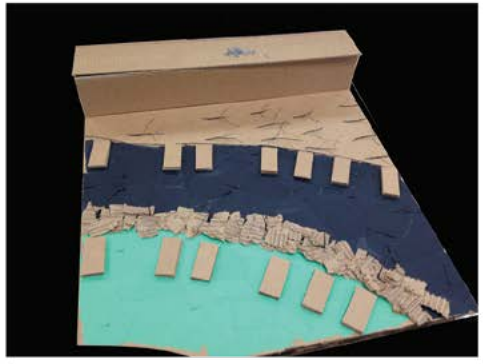
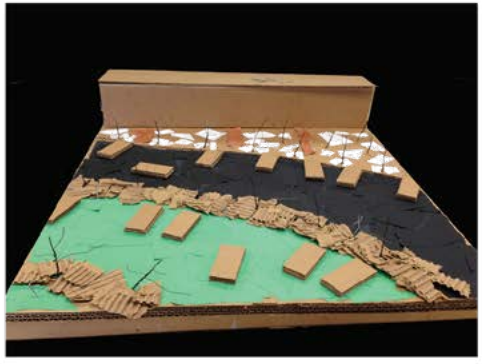
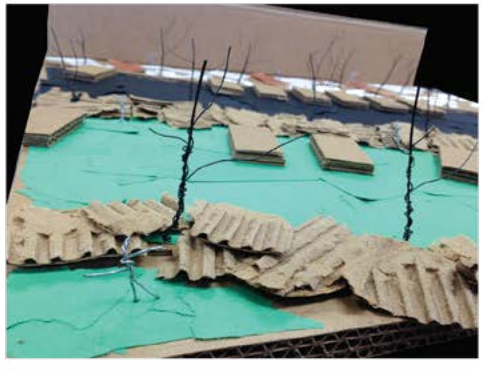
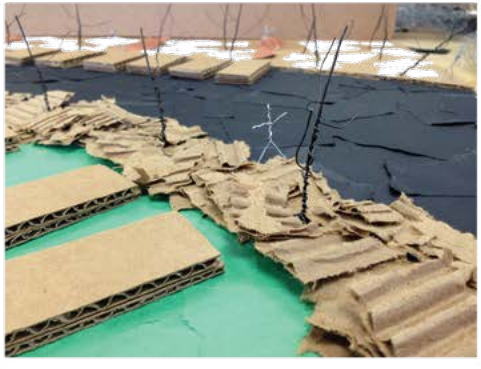
The design pattern chosen for vehicular circulation was in the shape of a “V.” The way that these interacted with the configuration of bio-swales created some leftover triangular spaces that could not accommodate parking.

These were turned into remnant green spaces, which were consolidated in the lower design as larger pedestrian areas that were more intentional in design.

Black Square Delineates Model Area on Following Pages



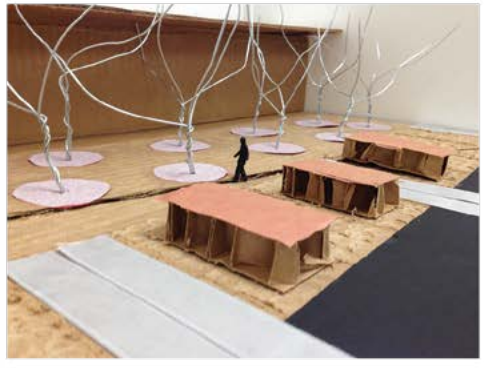
Test Model Area: The square highlighted in black ink marks the area of the model tests which appear on the following page.

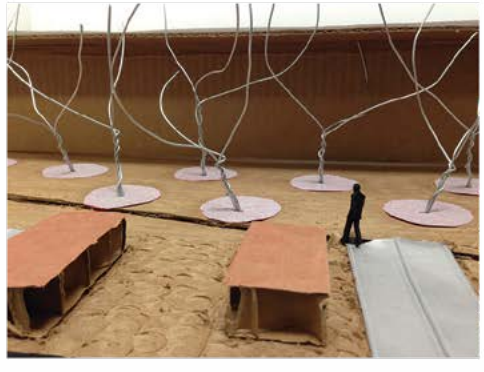

Model 1
(Islamic Garden Concept)


This model test explored a combination of impervious concrete and heat-reducing paving technology to increase infiltration and reduce surface temperatures respectively. Bioswale-lined striations increase infiltration of runoff on-site. Use of different materials close to the building, such as crushed decomposed granite, created a different texture underfoot and offered unique sound and tactile qualities.



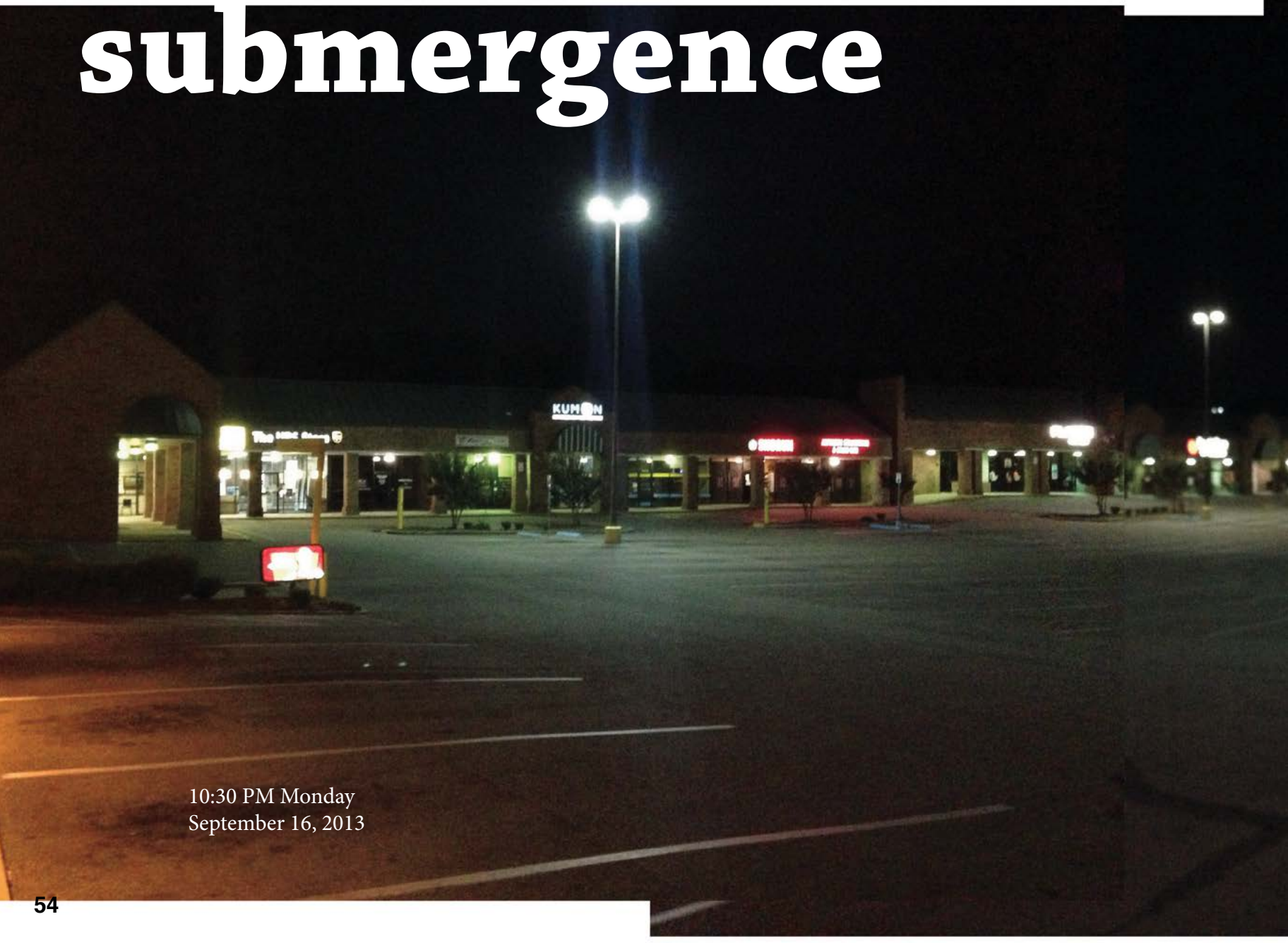



Model 2
(Islamic Garden Concept)




The purpose of model test two was to increase craftsmanship, add pedestrian walkways, showcase different tree types, and to differentiate areas using varying textures.

submergence



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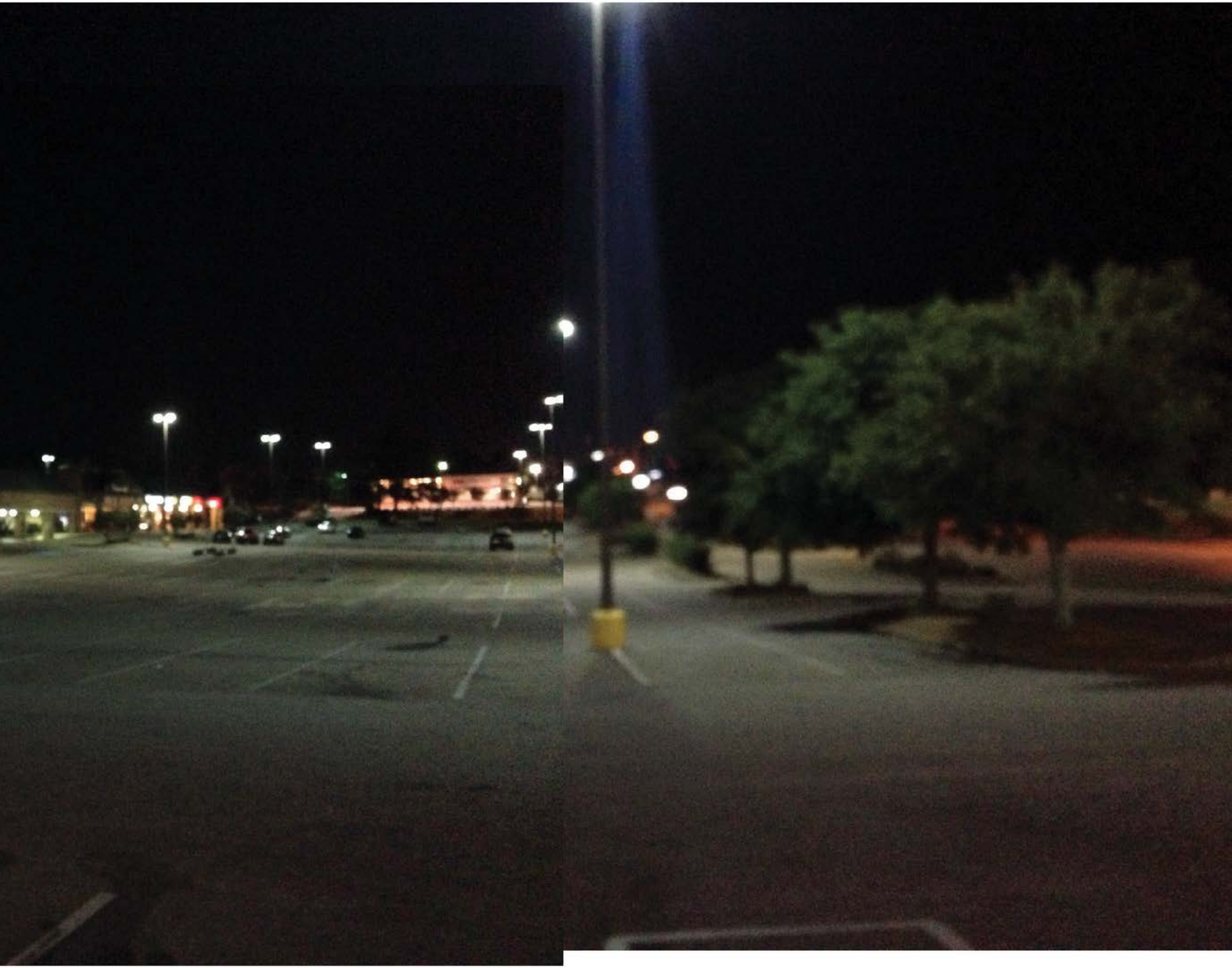


Submergence

Flint's Crossing Shopping Center is a locality with global implications. The site, like other parking lots, contributes to the global impacts of climate change and non-point source pollution. The network of static horizontal impervious surfaces on site prevents hidden processes beneath from achieving their full potential.

Hidden processes like groundwater infiltration and natural biological processes respectively increase aquifer levels and help decompose anthropogenic toxins. By unearthing the impervious surface and going beneath it, we can begin to comprehend those processes and see them with our own eyes. The next and final design goal is to create subterranean spaces that are democratic in nature, allowing water, people, animals, and plants to enter with total equality. The design is meant to enable natural systems to reach their full potential, allowing for greater social, economic, and ecological performance. The design also intends to promote a space where nature and culture are not divided.

The idea of creating a below ground space offers new opportunities to experience spatial and sensory qualities that are not found within a standard parking lot. Subterranean spaces create the experience of looking down from above as well as looking up from below and the unique perspectives that each can provide. The noise of passing traffic sounds from above are lessened as fewer sound waves reach down into the sunken room. When standing in the lower space one feels removed from the parking lot entirely in a private subterranean chamber. Use of different materials inside, such as gravel underfoot and various plant and tree varieties offer visual, sound, and tactile qualities to enliven the experience. The echo off corten steel walls adds another mix of sound, and the corten itself provides color variations throughout the day, purplish early morning and late evening, while more rust orange at mid day. The idea of submergence within the environment of a static asphalt surface provides a unique experience offering multiple reasons to visit the site besides just passing through the space before or after a visit to one of the retailers on-site.

Case Study: Erie Plaza
Milwaukee, WI
Stoss Landscape Urbanism

Erie Plaza offers a wide range of uses for visitors, offers contrasting materials within the space, captures and cleans stromwater, and adds an economic development component to the area (Stoss).

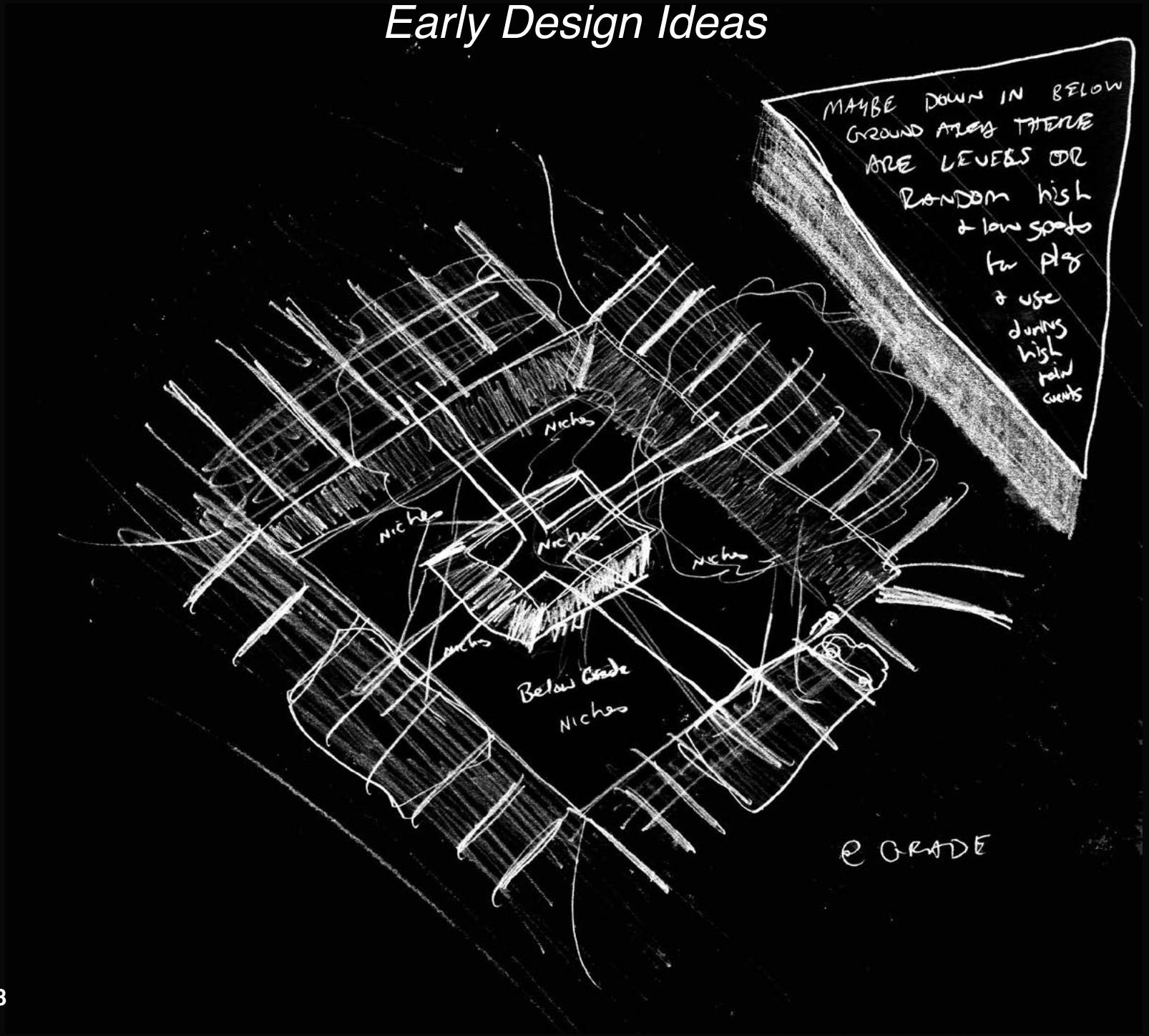
Takeaway
-spur economic development
-small insertions can create large outcomes
-programming for multi-use

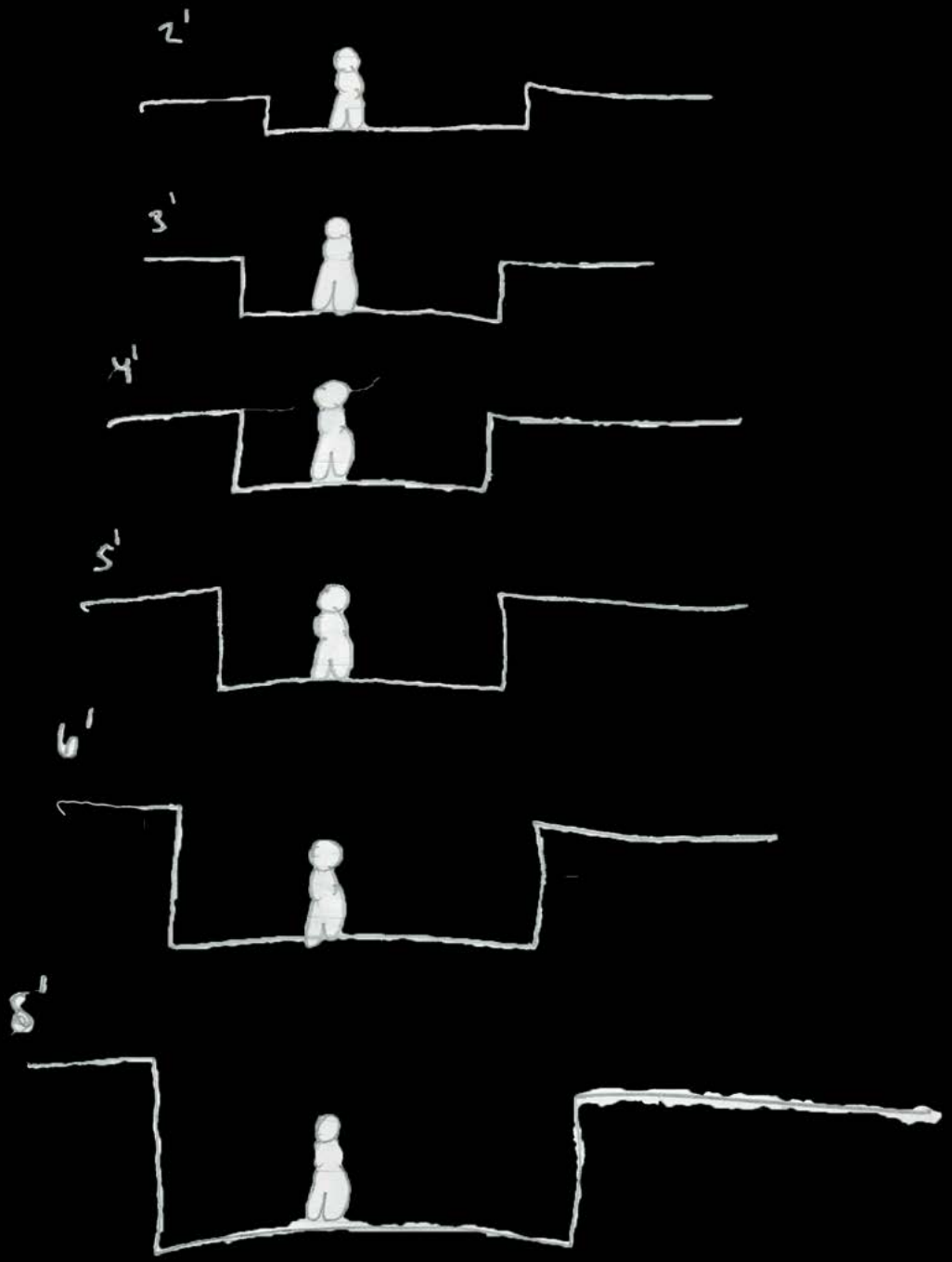
Figure 10

Figure 11

Figure 10

Early Design Ideas




2'
3'
4'
5'
6'
8'

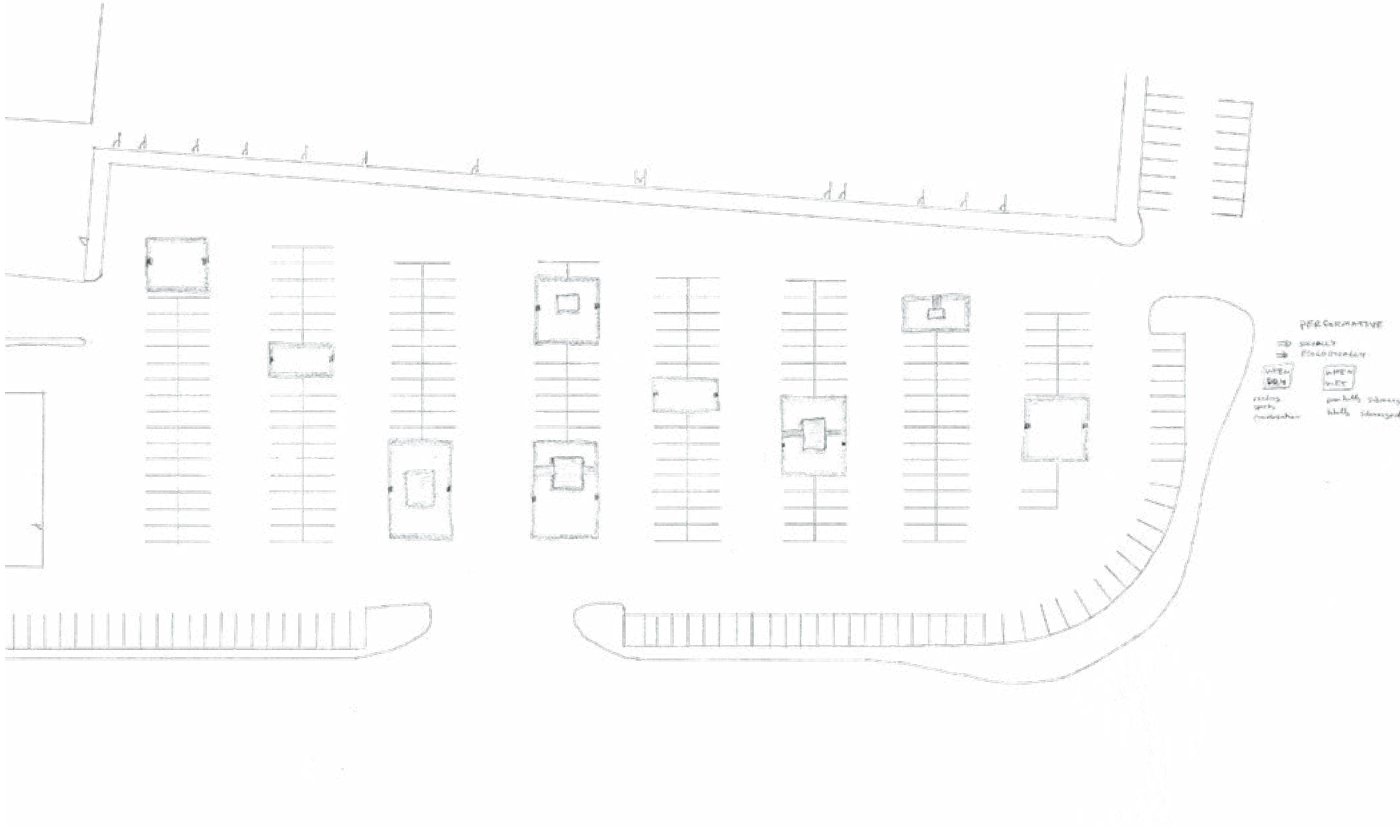
This deep section shows the multiplicity of layers from space where satellites are active, to the sky where airplanes fly and communicate, all the way down through the surface of an asphalt lot to soil horizons, bedrock, and aquifers hundreds of feet below ground. This informed greater thought toward what lies under the impervious surface, how each layer affects the other, and the phrase “out of sight, out of mind.”

By designing a sunken space 8 feet beneath the horizontal ground plane, a cooler microclimate, versatile spatial quality, and more dynamic condition results. The space is democratic in that nature and culture are celebrated. The space allows water to congregate and infiltrate after storm events. People can enter and use the space from morning until night. Hydrologic calculations determined how large and deep a space was needed to handle rain events as great as 5”, or a 20 year rain event. In Auburn, Alabama a 1” storm event is the norm.

Section Conceptualization

There are multiple reasons for employing subterranean spaces such as these. They are capable of holding events like weddings, dinners, lunches, outdoor movies, or other activities. They can capture all stormwater onsite to reduce reliance on the city's stormwater infrastructure saving municipal dollars. They provide ecological benefits to the area, providing greater bio-diversity of plant and animal life. Water that infiltrates these spaces contributes to higher groundwater infiltration. Socially they provide a place similar to a park for people to enjoy, promoting greater interactions among people in the neighborhood.

Plan Conceptualization

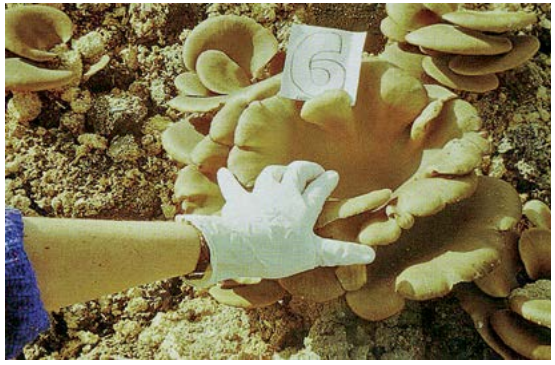


This first plan iteration involved remediating urban toxins using oyster mushroom mycelium. The squares indicate subterranean spaces, where sunken plant beds with oyster-mushroom-mycelium-infused mulch digest and reduce anthropogenic toxins found within the parking lot. This was inspired by Paul Stamets, a scientist world reknowned for his work using mushroom mycelium to remove environmental toxins. Deploying oyster mushroom mycelium in a case study, he showed how fungi are capable of destroying polycylic aromatic hydrocarbons, a bioremediation strategy teeming with future possibilities.

Mycoremediation is a form of remediation using fungi to degrade, sequester, and remove toxins within the environment (Stamets 2005). During the design process, there was a consideration to place subgrade mushroom beds in the center of parking spaces so that toxins could be collected and cleaned on-site. A sturdy metal grate would allow vehicles to park on top of it and people to walk on it, while allowing the mycoremediation to occur. With the focus of the thesis centered on the subterranean spaces, this idea was abandoned.

Diesel-contaminated soil being consumed by oyster mushrooms (Stamets 2005).

Figure 12



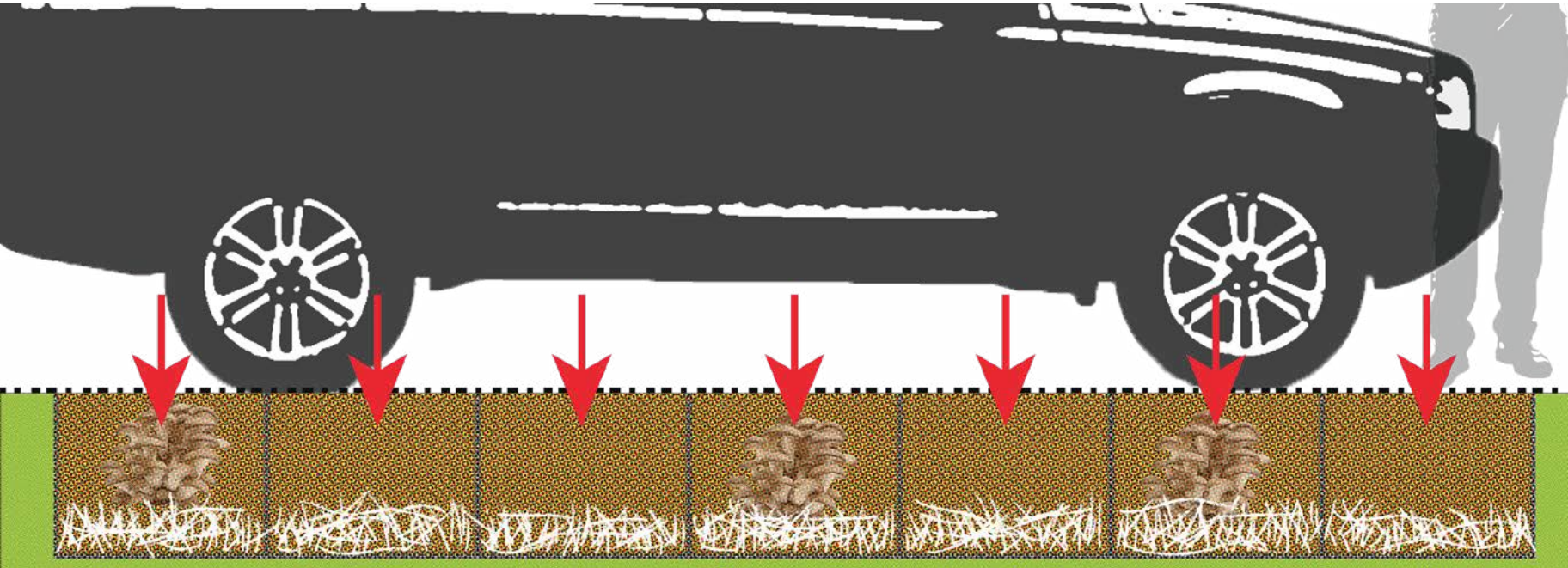
Large mushrooms are evidence of the nutrition found within the diesel-contaminated soil (Stamets 2005).

Figure 12

At the conclusion of the experiment when the mushrooms had decayed, plants began to materialize in places where a wellspring of life-sustaining soil had resulted (Stamets 2005).

Figure 12

Bioremediation Using Oyster Mushroom Mycelium

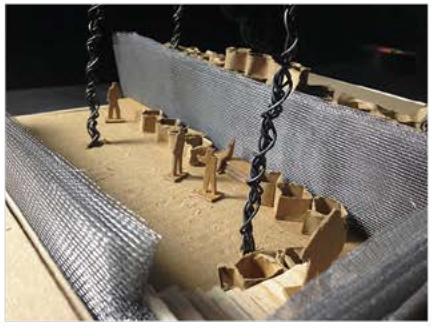


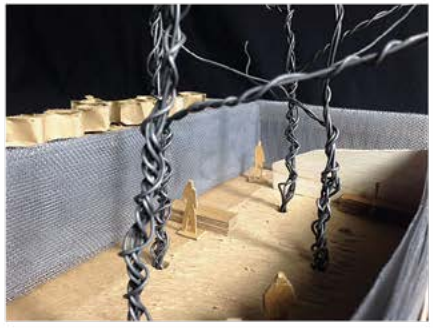
Heavy Metals & Polycyclic Aromatic Hydrocarbons (PAH)

(seep into the mycelium tray system)

Mycelium Fungi

(break down heavy metals & PAH's)

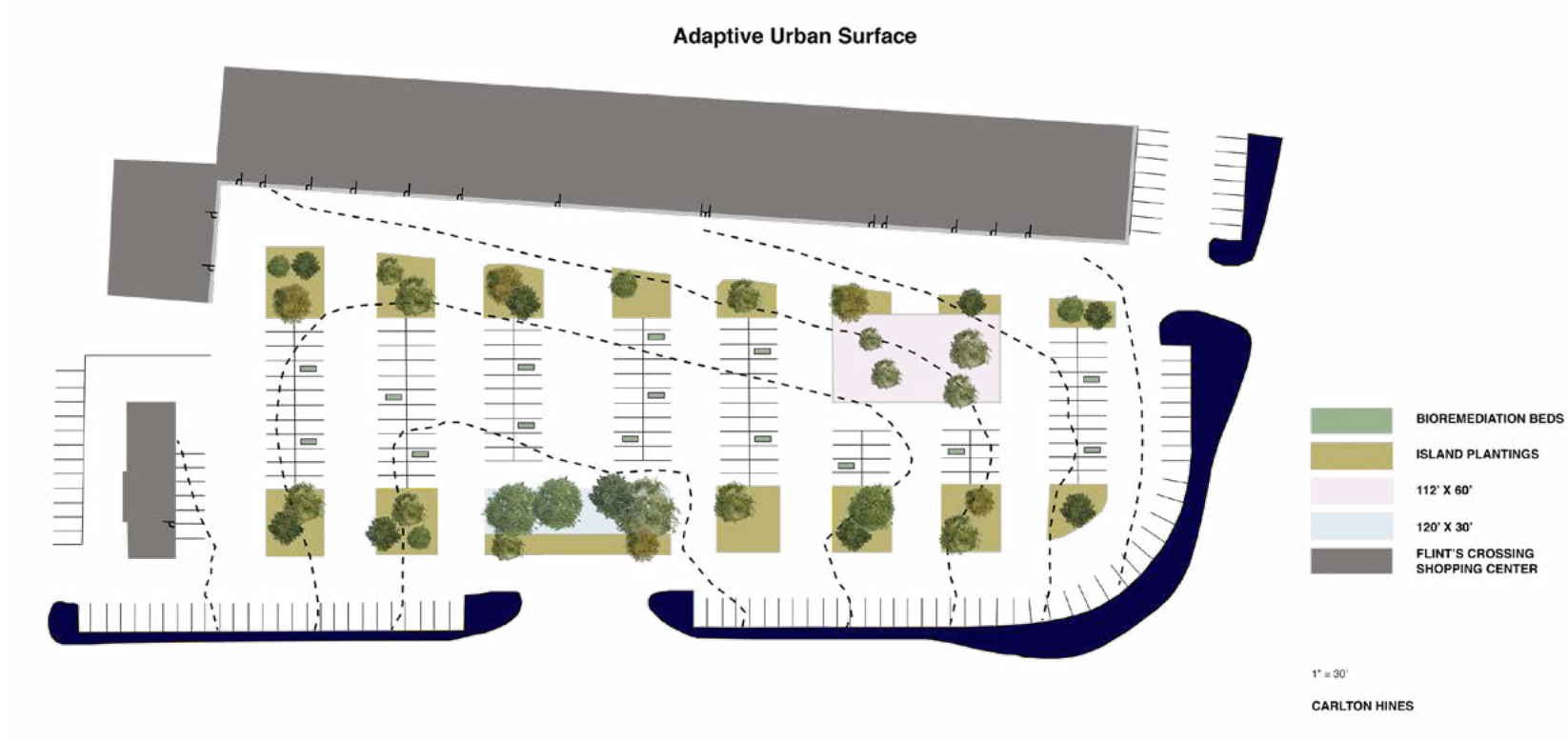





Model 3
(Submerge)


A wire gabion wall connects from the bottom floor of the subterranean room to 4 feet above the grade of the parking surface. The space offers unique spatial qualities, such as the perspective of being embedded below looking up to people, cars, and the sky above or being on the parking lot surface or in a car and peering down into the space.

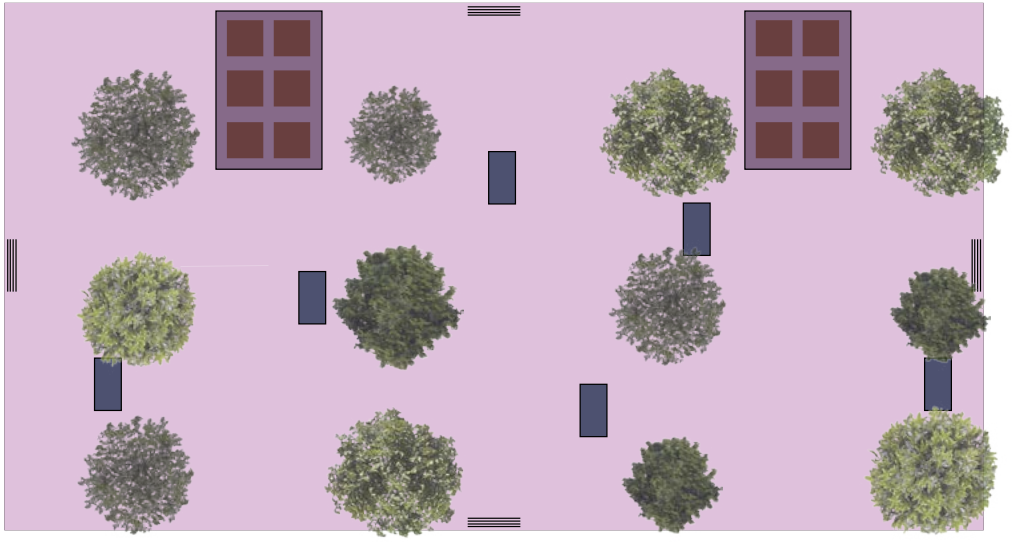
Submerged Spaces: Test Plan 1



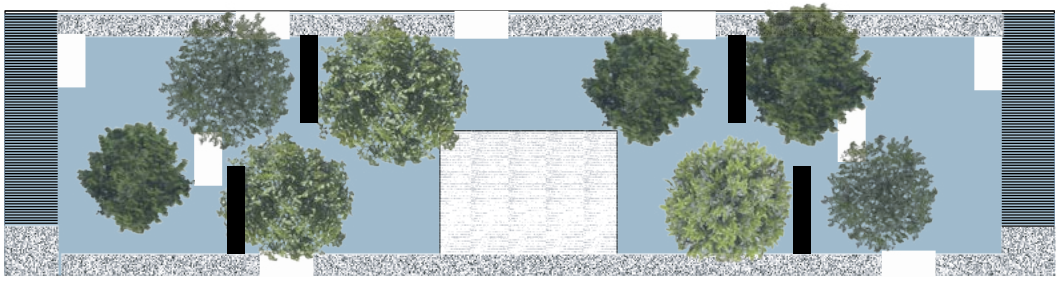
This is the first test plan that introduces two submerged spaces on-site as well as subterranean plant beds that utilize oyster mushrooms to mycoremediate toxins.

Plan Details: Submerged Space Test Design 1

PLAN DETAILS



112’ X 60’ BERMUDA GRASS
WOOD SEATING STRUCTURE
MOVEABLE TABLES & SEATING
MOVEABLE WOOD LOUNGE CHAIRS

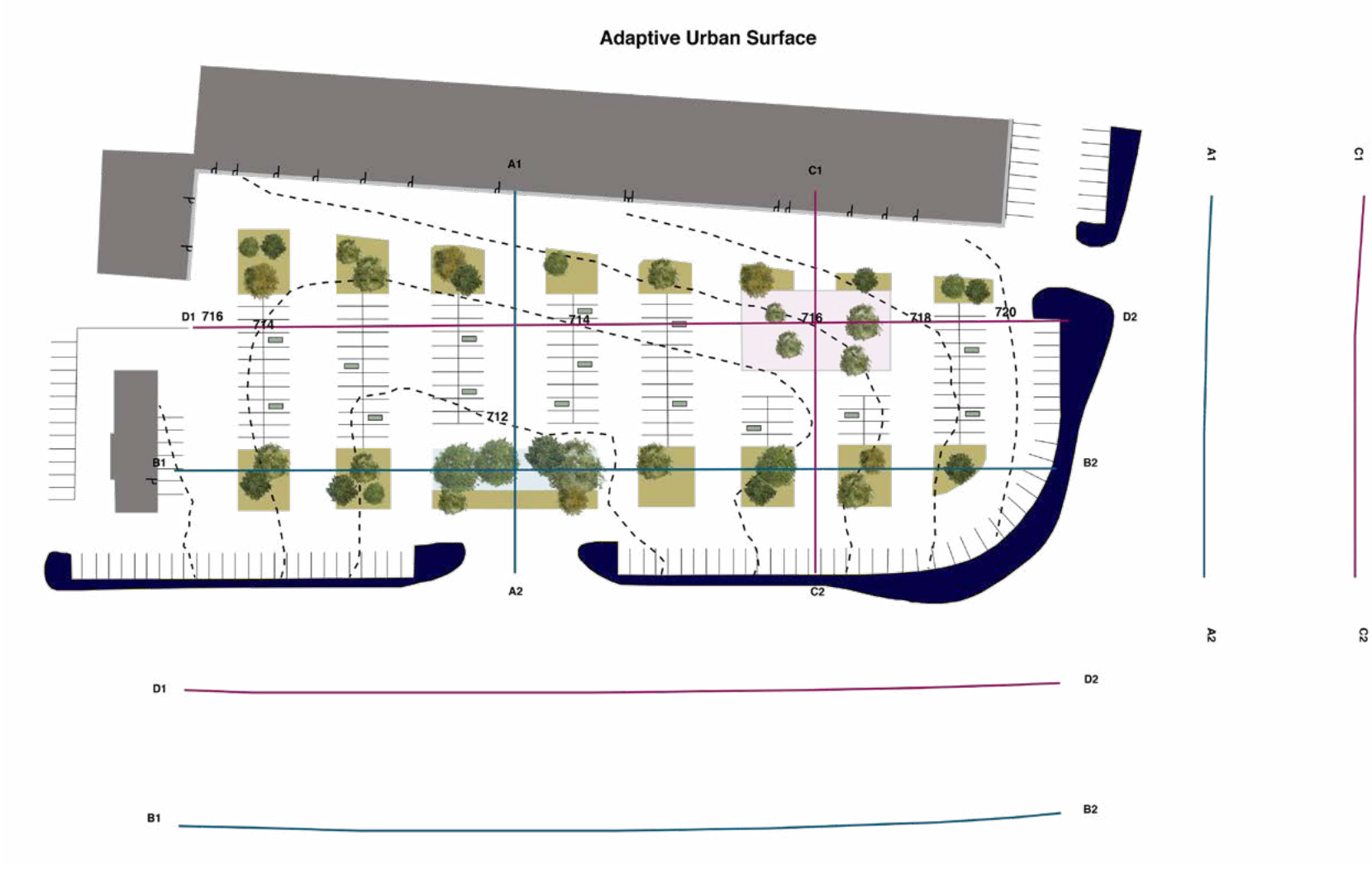


MOVEABLE WOOD BENCHES
PRECAST CONCRETE
GRAVEL
120’ X 60 BAHIA GRASS SURFACE
BLACK MARBLE WATER BASIN

Upper Room - 112’ long x 60’ wide x 8’ deep
-This room is designed as an above ground space, juxtaposed to the sunken lower room
-A wooden structure would elevate people above the parking lot, providing a unique perspective

Lower Room - 120’ long x 60’ wide x 6’ deep
-This sunken room will handle the majority of the parking lot’s stormwater runoff, handling a 5” storm event, in which case the entire room would fill to the top with water.

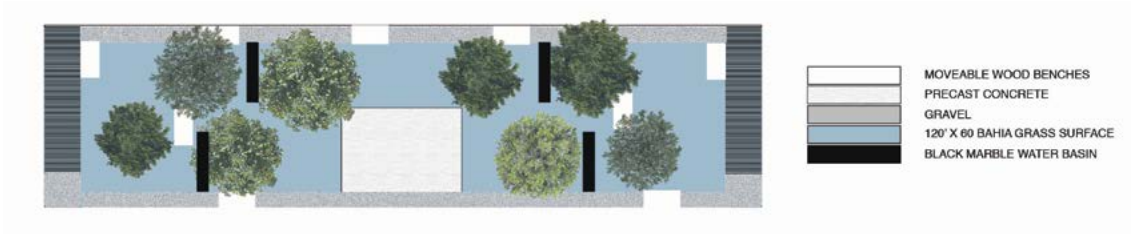
Section Profiles of Submerged Rooms



This section perspective introduces unique spatial qualities of the raised wooden structures where event and social activities occur. The space is planted in an orchard style to provide repetition and strong visual elements. Both active and passive play is provided with a lawn atmosphere.

Upper Room Plan and Sections

Tree varieties would use local deciduous varieties of oaks, sycamore, and elm which allow for cool microclimates in summer and allow winter radiation to penerate through bare branches in winter.



Moveable wood benches throughout allow for ample seating and open options for small and large groups. Bahia grass, gravel, and precast concrete areas for multiple activities.

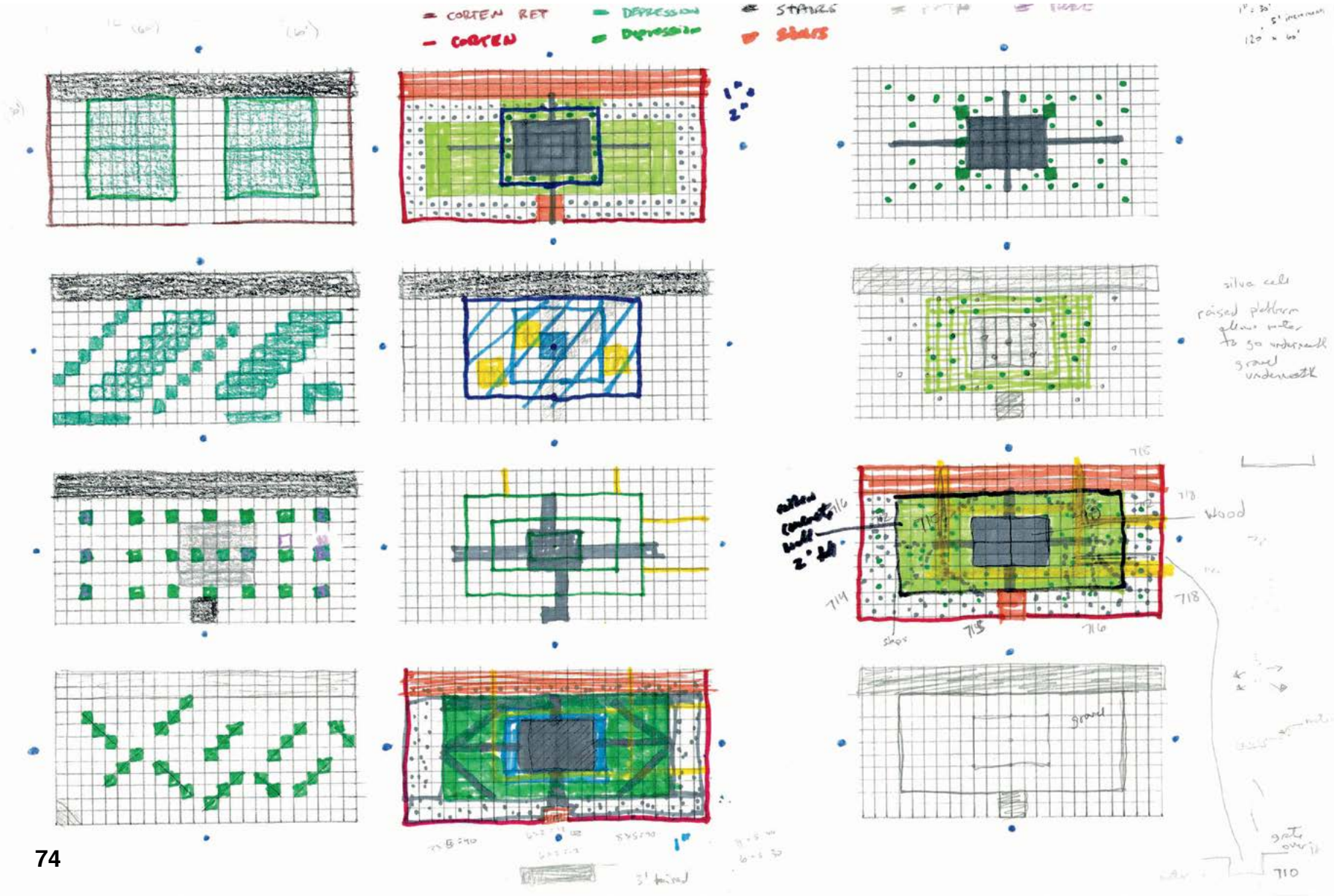
Lower Room Plan and Sections

elevation 712'

This provides the short north to south section of the lower room. A precast concrete platform allows for a central event area. The room is designed to handle versatility, allowing the space to work for day and night events, and rental opportunities for retailers or private individuals.

Upper Room120’ x 60’ Plan Iteration Process

5’ x 5’ grided squares to work in scale



Working Through Ideas

-two large fields of grass
-stairs on top side

-central concrete space gathering area
-lawn gathering space on both sides
-stairs on top side

-central stage with rooms created using trees
-multi-use outdoor space

-diagonal grass design exploring visual dynamics
-stairs on top side

-central water feature area that collects runoff
-visual and sound qualities promoted
-re-use of water

-silva cell technology applied allowing water to infiltrate
-raised structure for social events
-grassy areas for sitting, sunning

-trees planted orchard style for strong visual aesthetics

-two entrances
-central deck structure
-grassed lawn areas
-runnels to channel water into areas specified to handle runoff

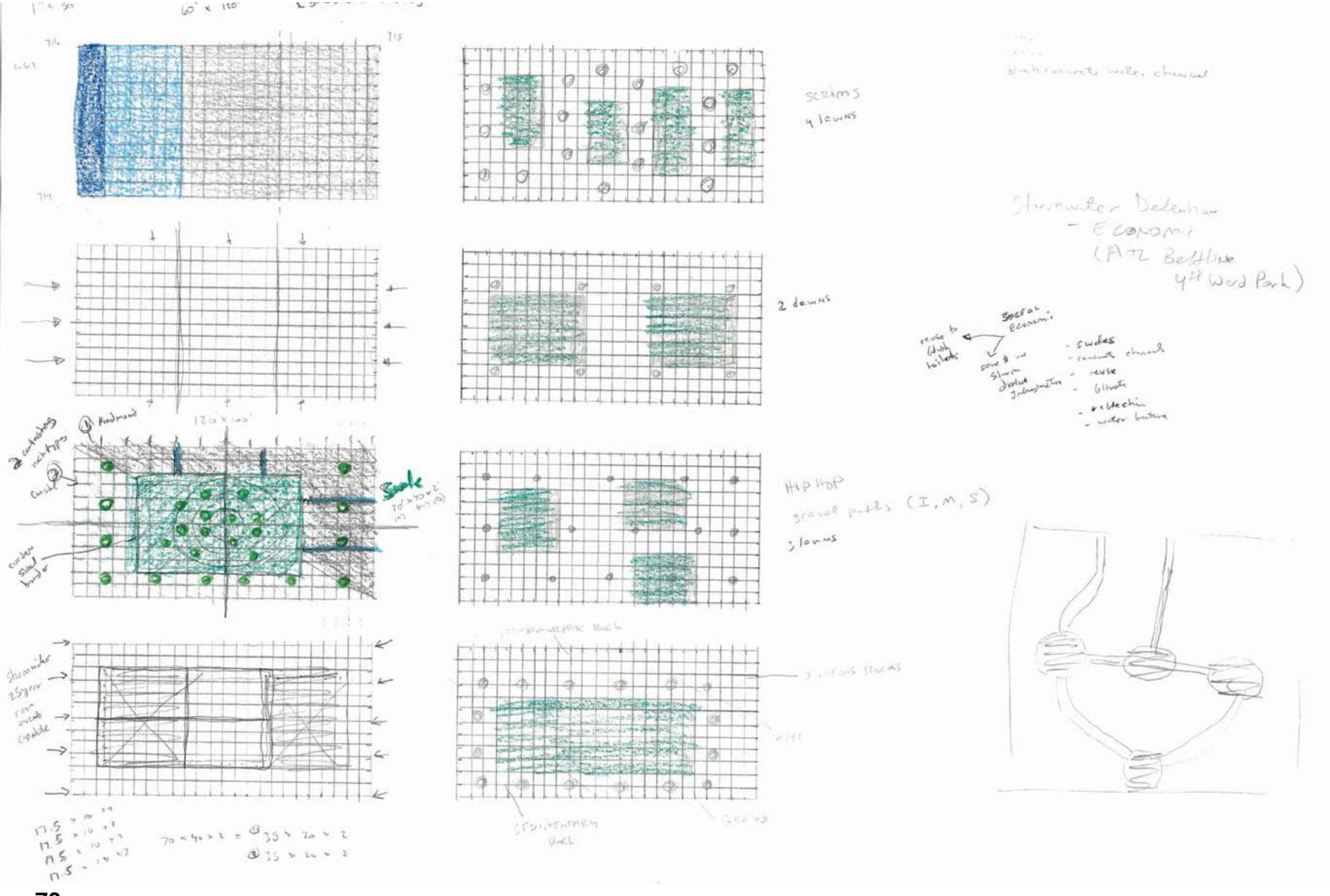
-wood central deck
-corten steel walls provide temporal color changes
-gravel on outside edges
-space in green to handle runoff inundations of up to 5”

-diagonal tree plantings exploring spatial qualities

-raised central structure
-gravel around edges of room
-sound quality of gravel
-stormwater runoff are in center

-different gravel types to represent the ecotone between the coastal and piedmont

Upper Room Plan 120’ x 60’ Plan Iteration Process
5’ x 5’ grided squares to work in scale



Working Through Ideas

-rule of thirds to inform layout design
-gravel 2/3 (coastal shale)
-runoff area 1/3 of space
-metaphor for the ecotone

-green squares are sunken areas to handle runoff
-trees provide enclosure using scrims

-thinking about the rule of thirds and how to divide areas within the space
-utilize black concrete in water detention area for reflectivity

-green squares are sunken areas to handle runoff
-2 larger sunken spaces

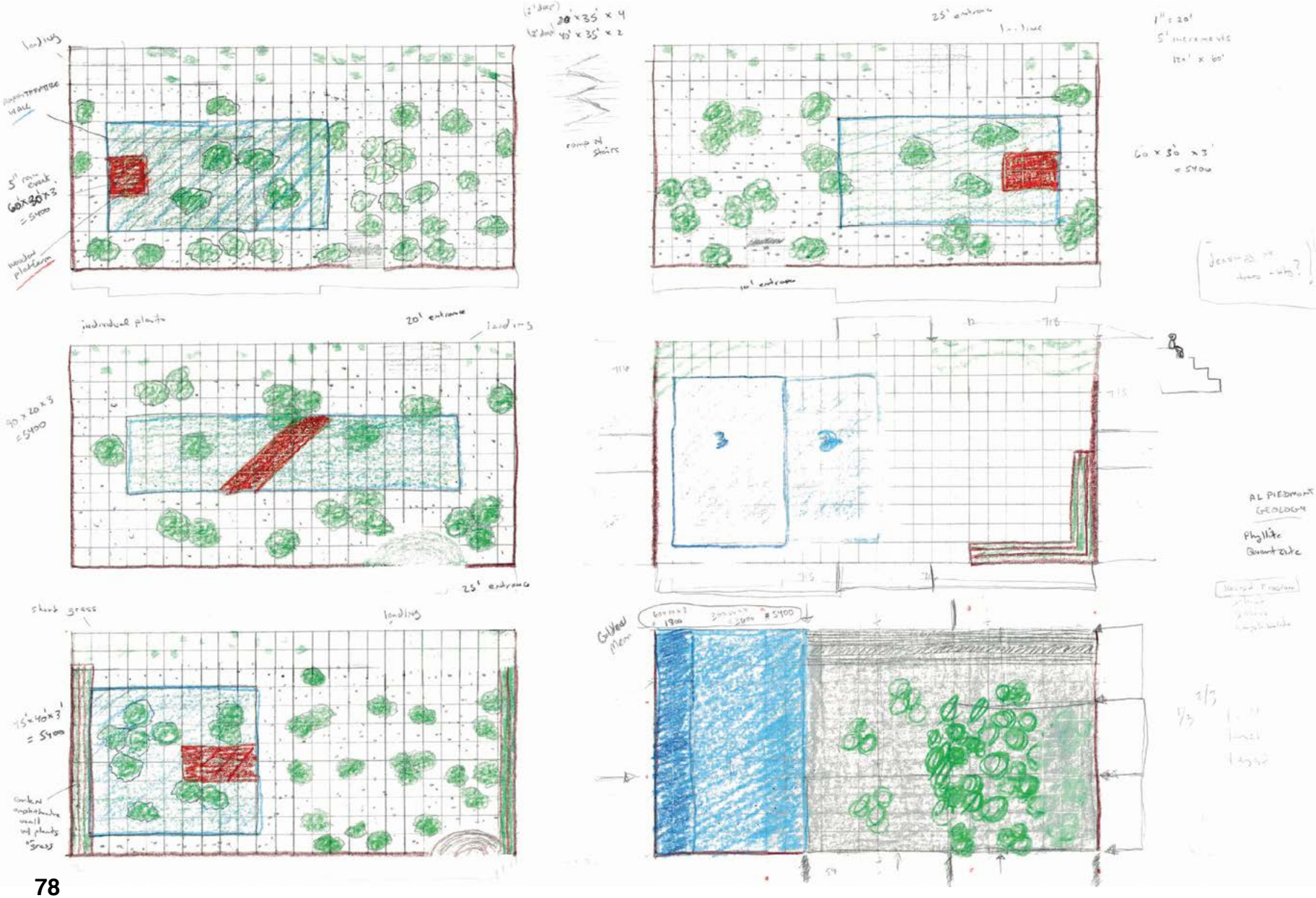
-central area handles stormwater
-outer edges are gravel
-trees create enclosure

-green squares are sunken areas to handle runoff
-3 smaller sunken areas
-trees provide enclosure
-trees planted in hip-hop rows

-two boxes are stormwater detention areas
-re-use water to flush toilets
-increase infiltration of storm-water

-green squares are sunken areas to handle runoff
-1 large sunken area
-trees provide enclosure
-gravel mixed with piedmont and coastal rock (ecotone)

Upper Room Plan 120’ x 60’ Plan Iteration Process
5’ x 5’ grided squares to work in scale



Working Through Ideas

-smaller interior square is a sunken area with sitting walls 2 feet tall
-trees are in clumps so they grow close to one another providing more shade
-gravel ground plane provides sound quality
-coretn steel walls
-sitting walls around blue box, which is a detention area for runoff
-60’ x 30’ x 3’ (=5400) detention area (5” rain)

-stormwater area iinside inner blue colored box
-orange color represents a wood deck
-trees planted in groupings
-25’ entrance on top right (N)
-10’ entrance on bottom (S)
60’ x 30’ x 3’ (5400) detention area handles a 5” rain event

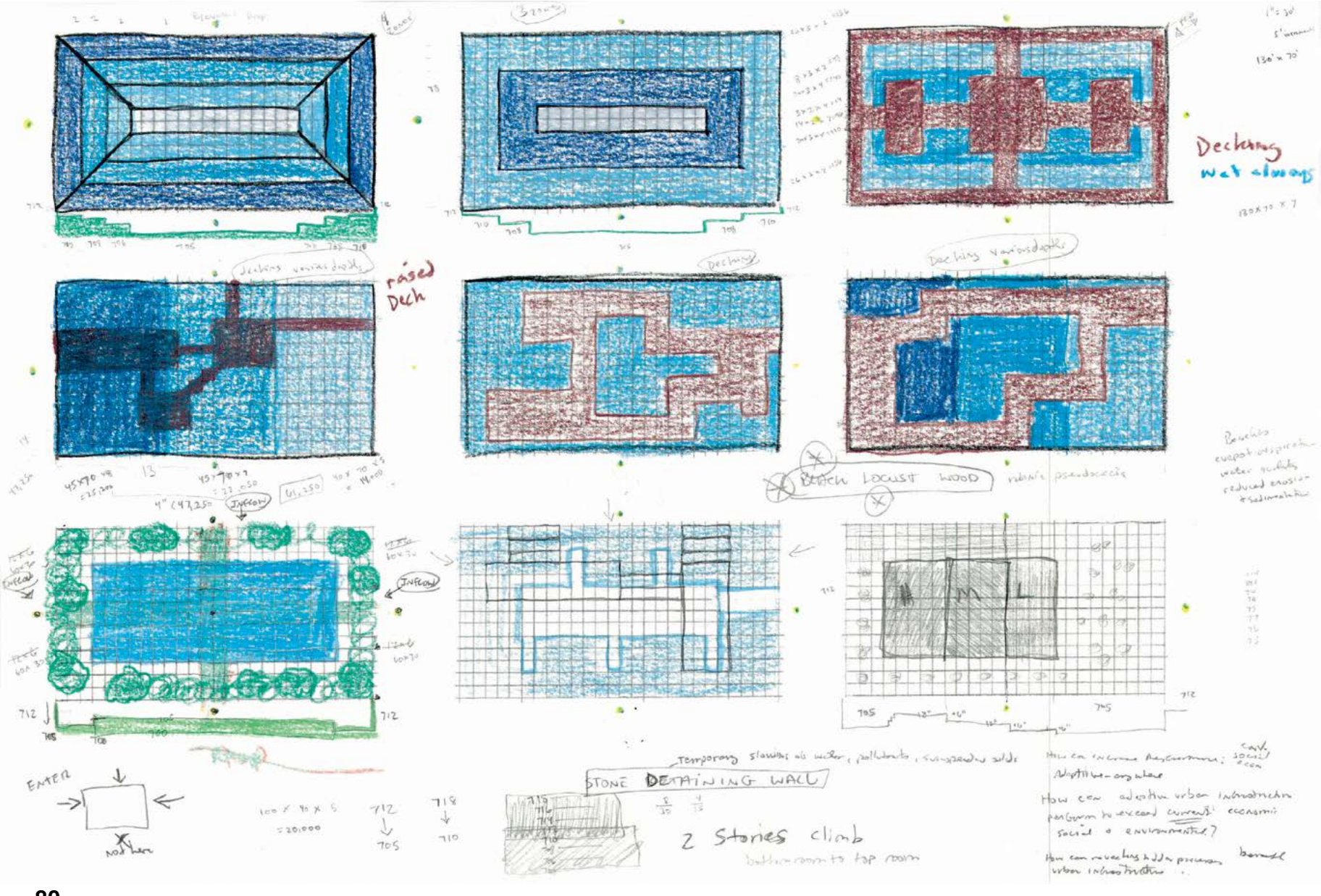
-central green box represents the stormwater area
-bridge extends over the stormwater area for seating and movement
-trees planted in groupings to create shaded microclimates
-90’ x 20’ x 3’ (5400) detention area

-box on left is 3’ deeper than 8’ deep room
-box to its right is 2’ deeper than 8’ deep room
-stairs bottom right
-remainder of area is gravel
-45’ x 30’ x 3’ (4050) detention area left
-45’ x 25’ x 2’ (2250) detention area right

-stormwater runoff area is inner square box
-rounded step entrance bottom right
-gravel ground plane consists of shale
-river birch planted in groupings for shade
-use of stone, wood, gravel to vary ground plane and sensory experience
-corten amphitheatre wall with plants on left side of room
-45’ x 40’ x 3’ (5400) detention area for 5” rain

-final design consideration
-50’ x 10’ x 3’ (1500)far left dark blue box is stormwater area
-30’ x 50’x 3’ (4500) light blue box
-gray represents gravel
-green represents groupings of river birch to provide shaded microclimate for seating
-piedmont schist stairs
-coastal shale ground plan

Lower Room 130’ x 70’ Plan Iteration Process
5’ x 5’ grided squares to work in scale



Working Through Ideas

-this explores a stepped system of terraces 10' wide each level
-plants fill parts of the stepped areas
-other areas are steps for foot traffic and sitting

-another stadium seating arrangement with places for sitting, plants, and walking up and down
-gravel ground floor on lowest level
-shrubs and trees planted around

-wood decking provides a raised platform above a gravel ground plane that becomes inundated by water
-shrubs and trees planted inside

-wooden steps and decking area with seating
-water is always present
-stormwater runoff is collected
-hydric plants remediate pollutants

-a central raised decking platform allows places to sit and walk
-space is always filled with water collected from runoff
-hydric plants remediate

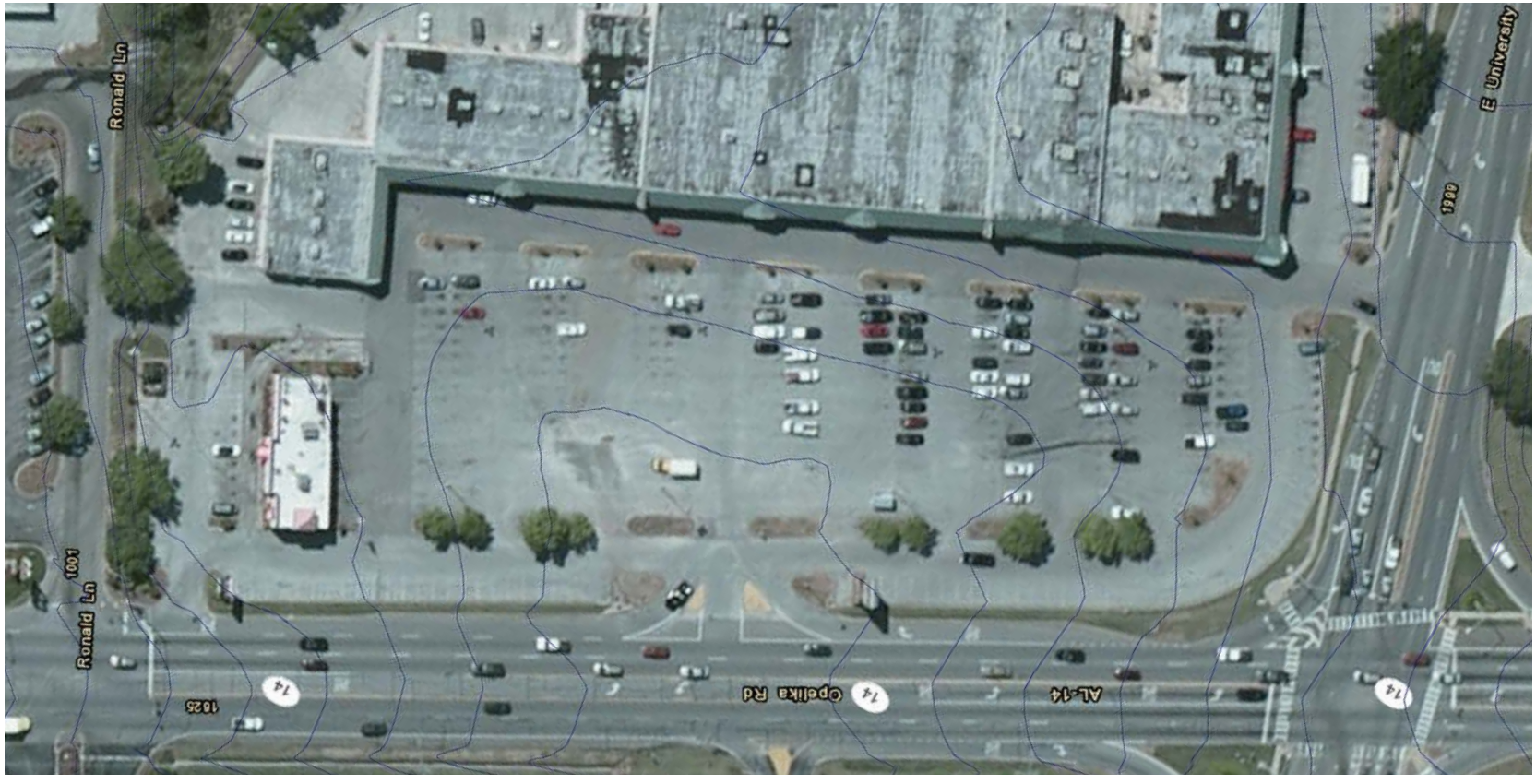
-decking system is made of Balck Locust which is a sustainable pioneering species adaptable to wet environments
-three depths inside the space handle 5" storm events

-bald cypress planted around the edge create feeling of enclosure
-gravel areas around the edges for walking
-central pool for reflection and quiet time

-steps in two areas lead down into the space
-wood decking in the center of the space has tables and chairs

-space is divided into three areas
-low areas for hydric plants
-mid areas for mesic plants,
-higher drier xeric areas.
-Gravel composes outer areas

Hydrologic Strategy to Determine Room Size and Placement



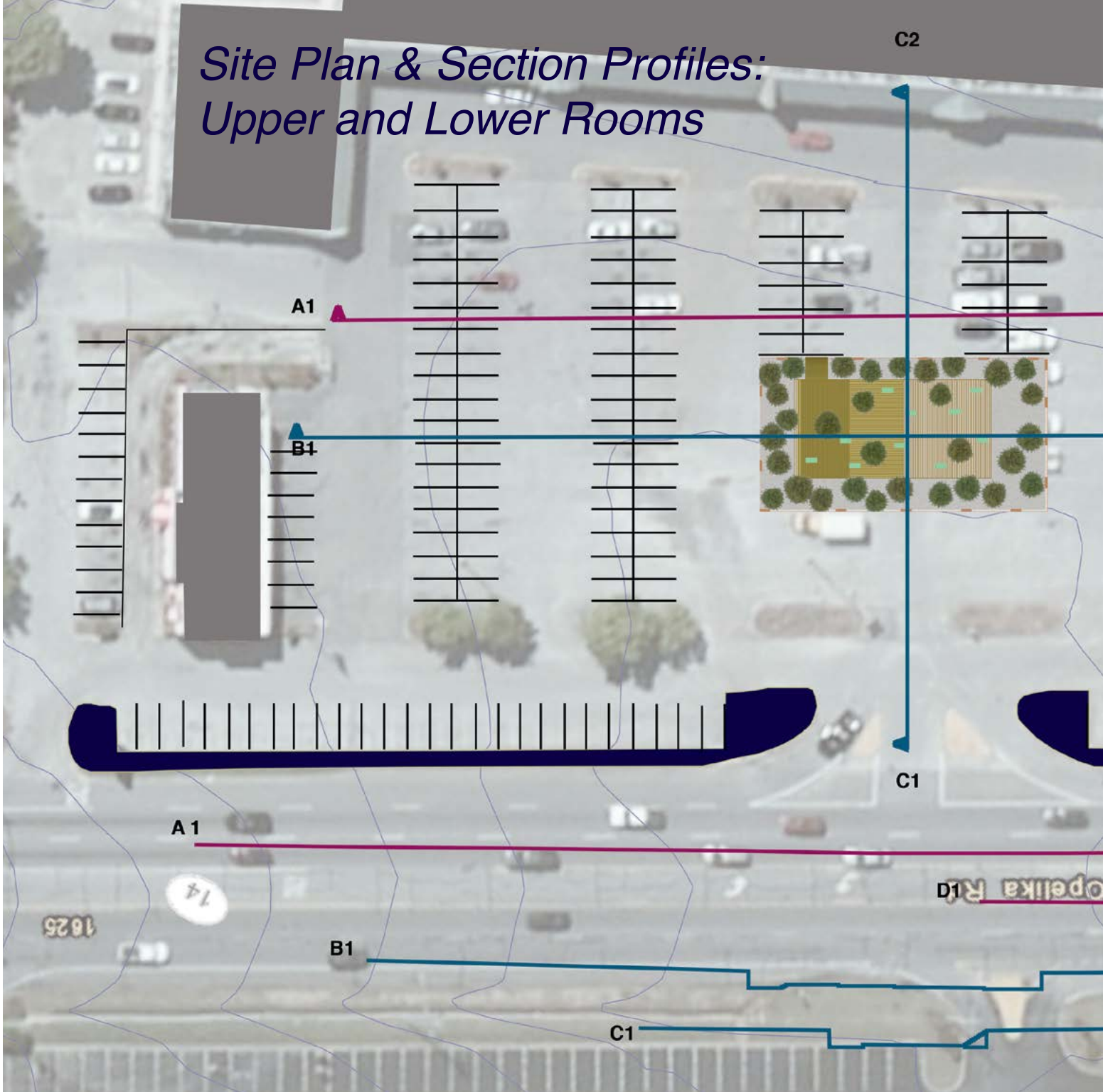
Upper Room

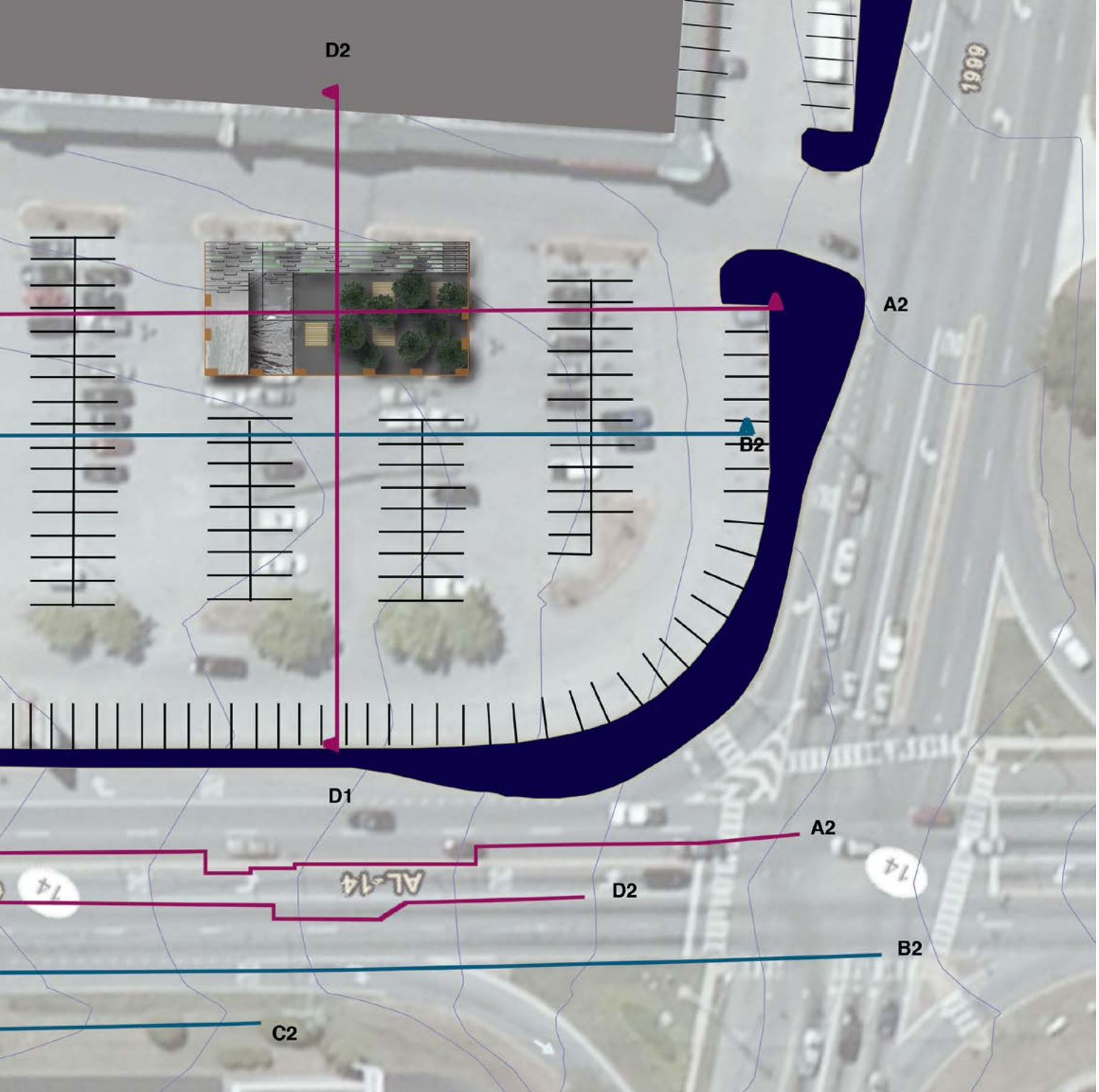
-planned with specific areas that become inundated by stormwater during rainstorms
-detention pond area slows water down and releases it slowly to stormdrains, reducing erosion to nearby streams
-this room is on higher ground and sees less water infiltrate during storm events (5400 square feet = 5” rain event)
-the water that collects during rain events releases at 5 gallons per minute
-5,000 square foot drainage area handles 5” of rain
-size of room is dependant on the ability for it to handle 5” storm event
-theoretically by placing the room in the most used area of the mall parking lot, its chance of success is increased

Lower Room

-the entire room is meant to fill up with water during a 5” rain event
-it acts as a detention pond that collects water, slows the release down, and allows some water to infiltrate
-the room has a large volume of water that infiltrates during storm events
-releases water at a standard rate of 5 gallons per minute so water is not in the space at all times
-59,473 square foot drainage area handles 5” of rain
-size of room is dependant on the ability for it to handle 5” storm event
-placement of the room in the lowest area of the parking lot insures that all water drains to it

Site Plan & Section Profiles: Upper and Lower Rooms

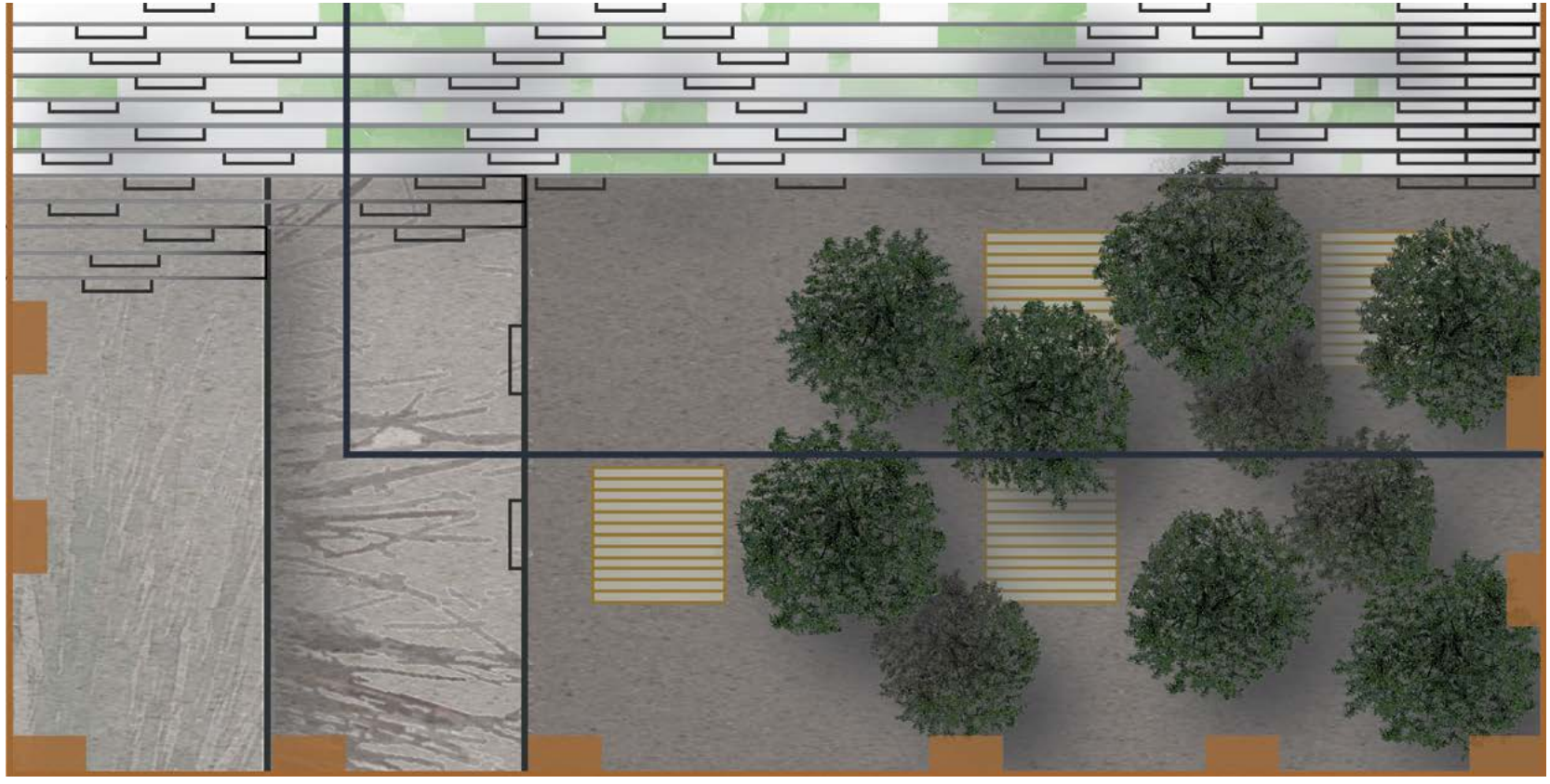



D2
A2
B2
D1
A2
D2
B2
C2

Upper Room Perspective (120' x 60' x 8' deep)

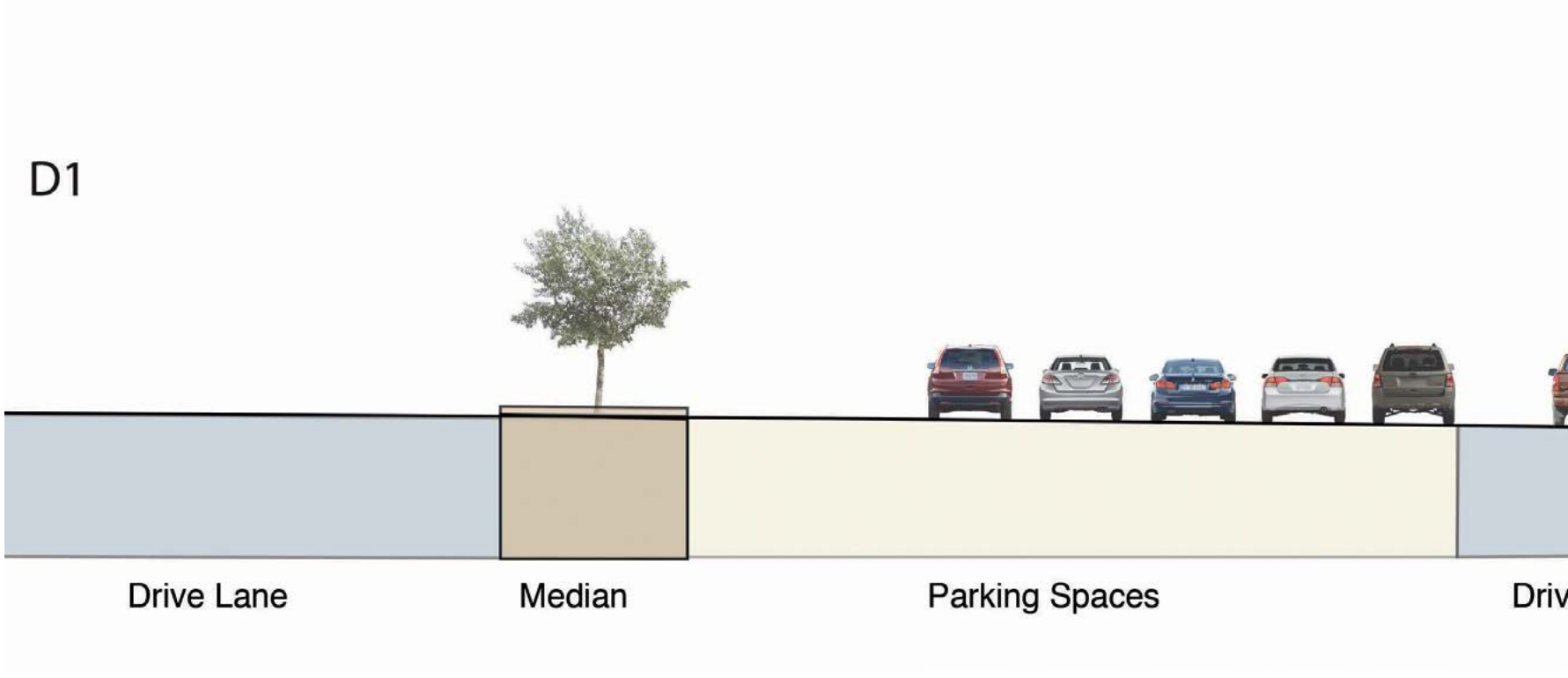
-entry stairs are made of quartzite, a geologic rock type reminiscent of the piedmont
-the ground plane bottom of the room is made up of slate which is reminiscent of the coastal plain
-in Auburn, AL the Coastal Plain and Piedmont Plateau meet.
-quartzite and schist metaphorically represent the ecotone. Gravel texture provides both sound and tactile qualities.
-river birch are planted in groups to provide shade. Their bark provides a visual texture.
-the Corten steel retaining wall changes color throughout the day from purple in morning and evening to rust iron at mid day due. Its color provides visual interest, and corten steel speaks to the iron content within the soil.
-the reflective quality of water adds another sensorial dimension to the room.

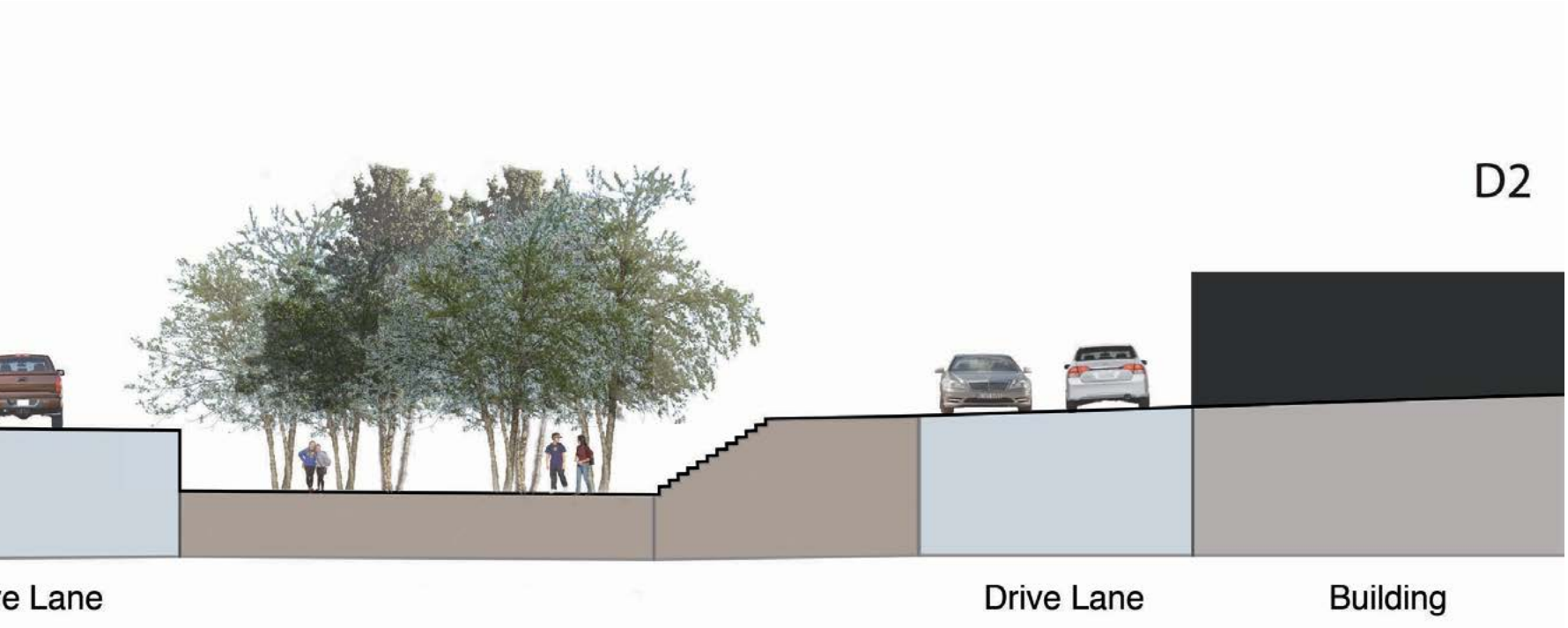
Upper Room Plan



-the two left vertical rectangles within the space are 3 and 2 feet deeper than the 8 foot deep room, handling inundations of water during high rain events.
-tall grasses populate these inundation areas to act as phytoremediation agents for the anthropogenic toxins carried in by water.
-the square area containing trees has wood decking for tables and chairs.
-cantilevered corten steel benches along the wall fade into the corten background and offer ample seating.
-a catch drain outside the room directs water down into the space, where runnels channel water into the runoff inundation areas. The concrete retaining walls bordering the inundation areas offer another seating area.
-the stairs entering the space offer seating areas, which are interspersed with planting beds.

Upper Room Section 1

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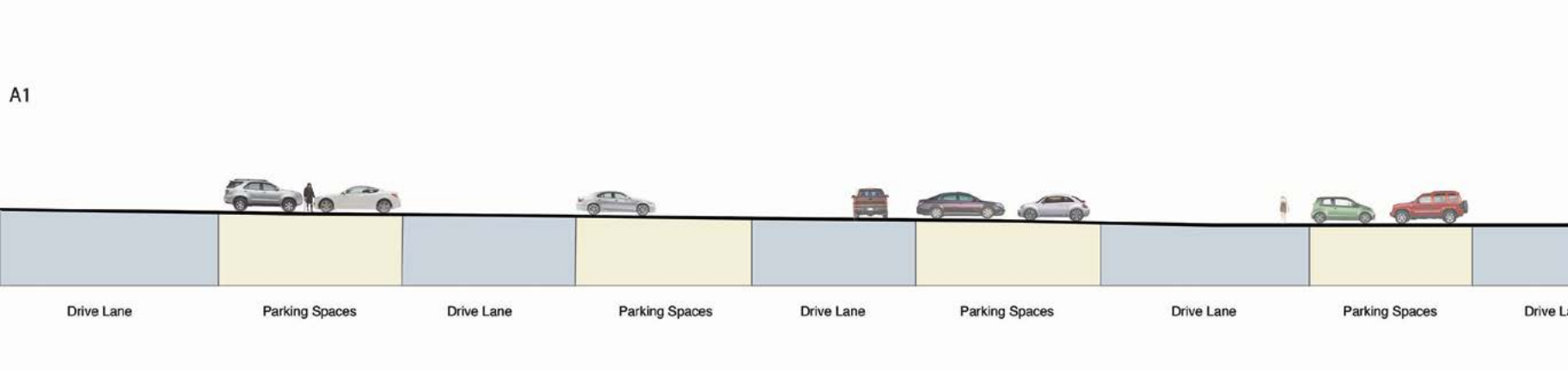
Drive Lane
Building

Upper Room Section 2




A2
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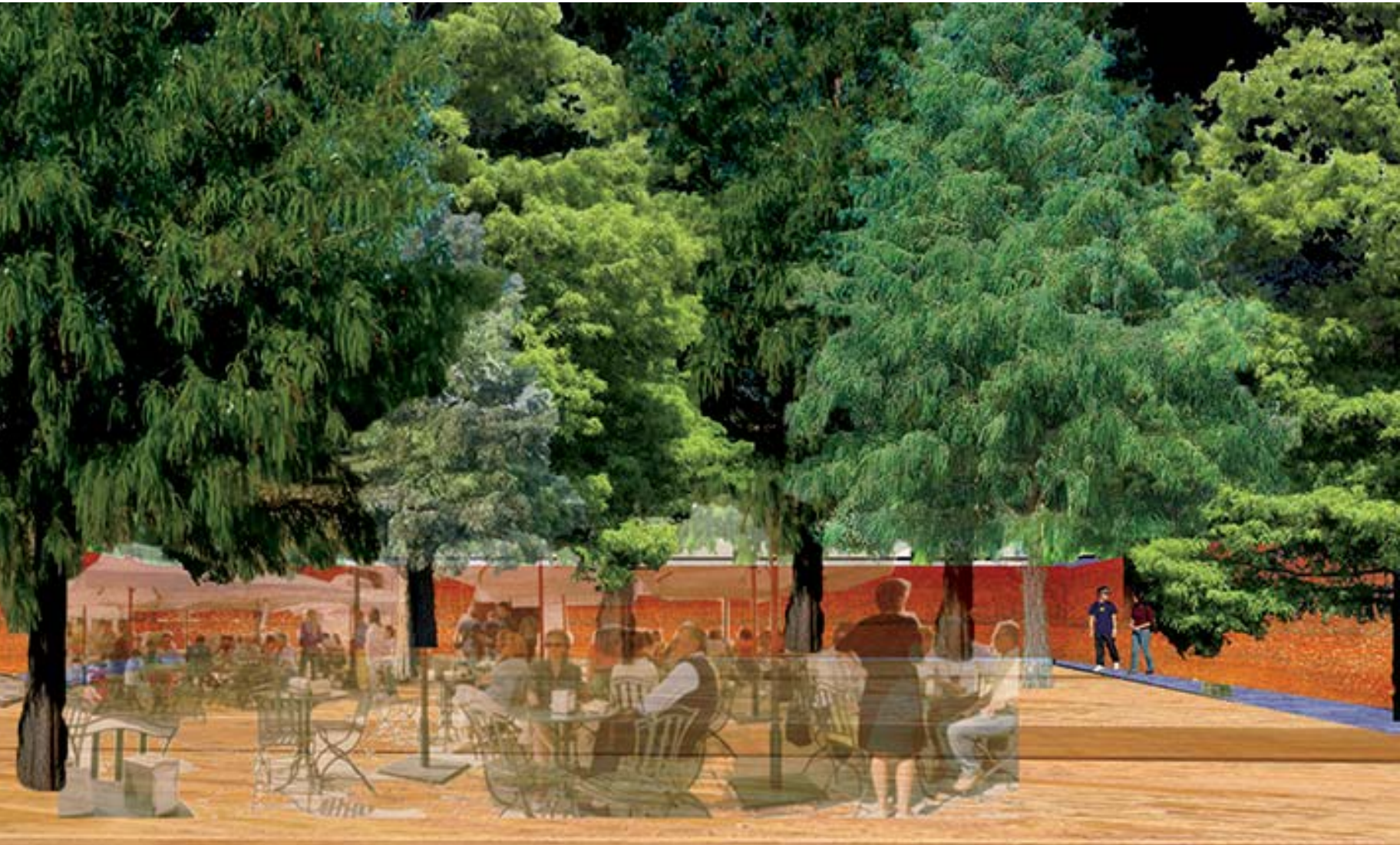
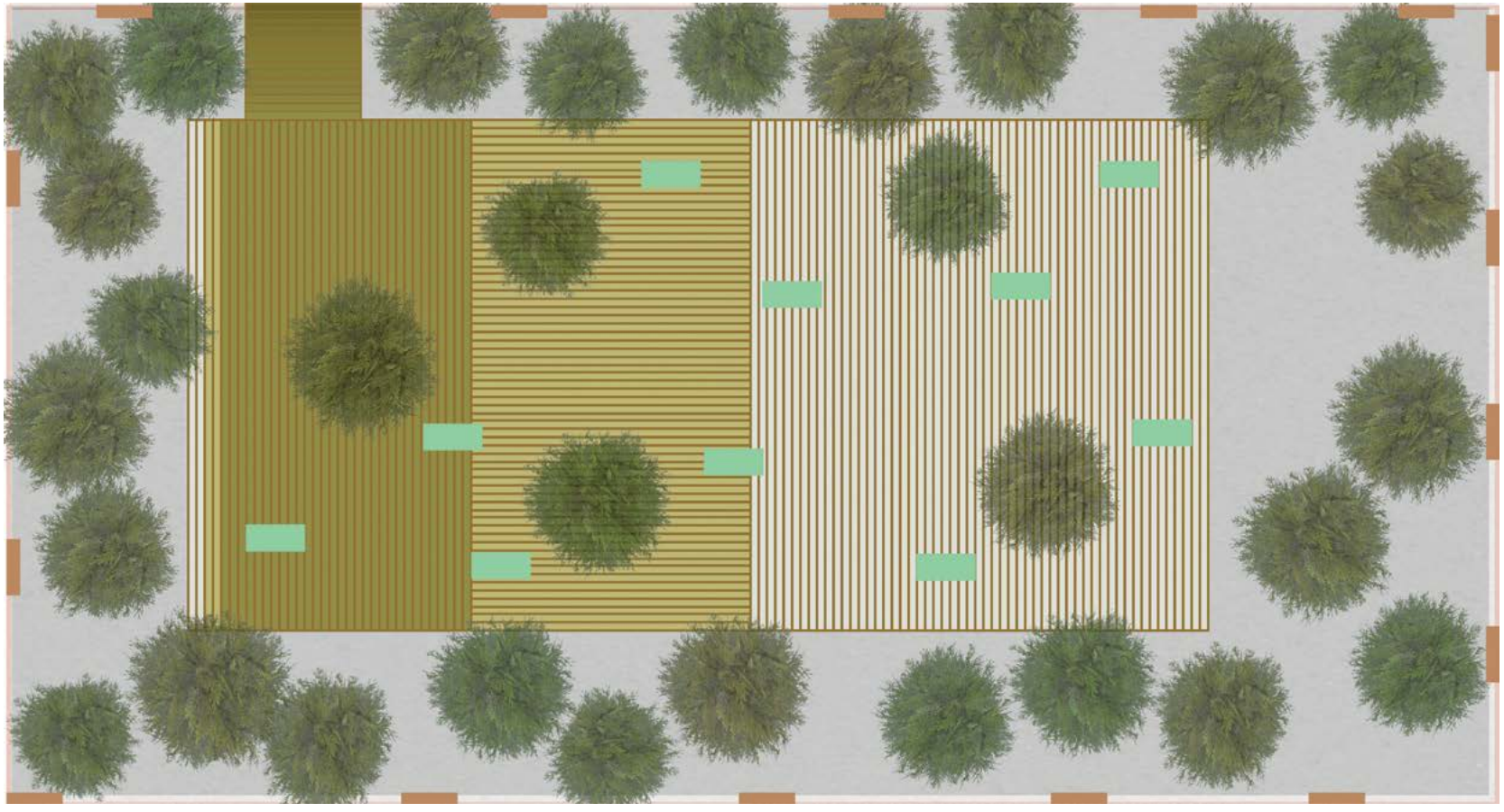
Parking Spaces
Drive Lane
Drive Lane
Parking Spaces
Drive Lane
Parking Spaces

Lower Room Perspective (130' x 70' x 7' deep)



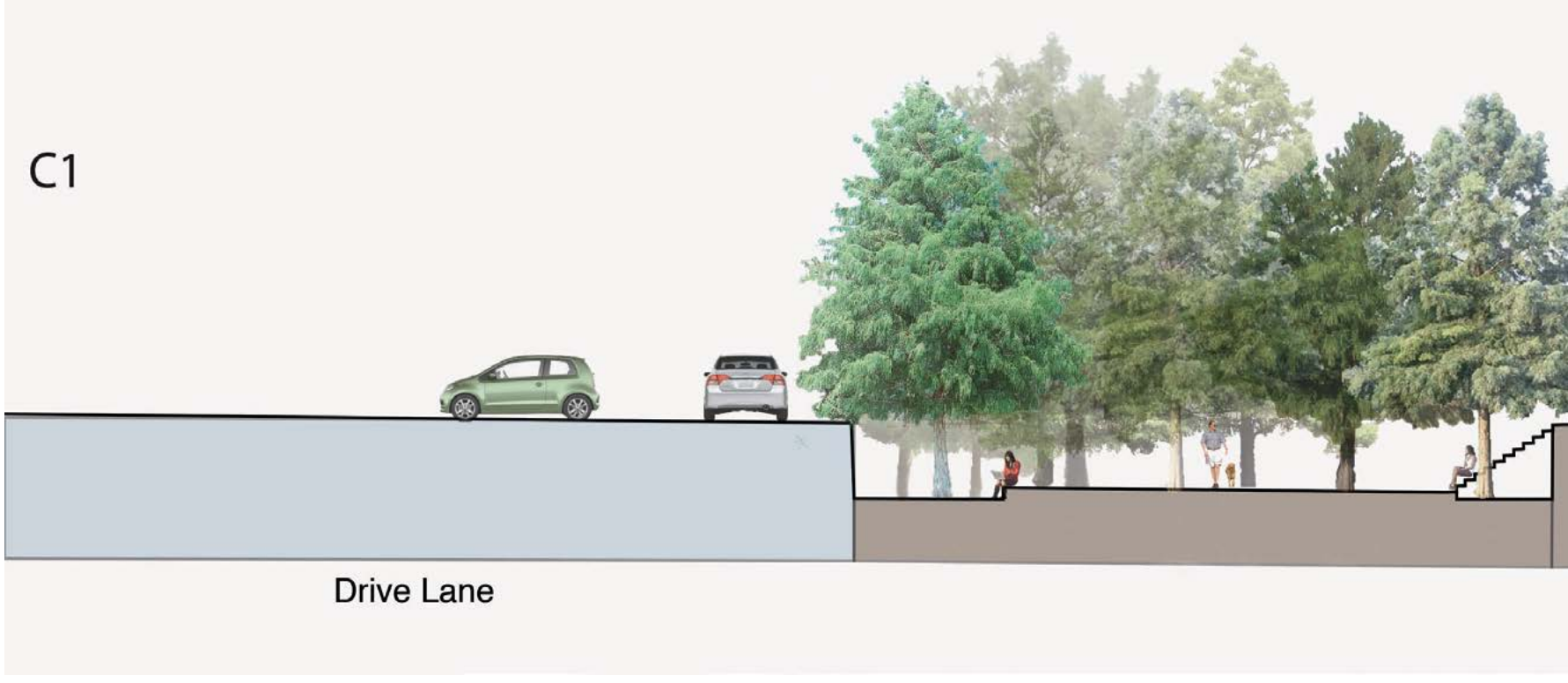
-gravel ground plane allows water to infiltrate the space and tall grasses are interspersed to remove toxins from runoff
-bald cypress trees take up this space around the outer edges, to block views from outside, providing a feeling of enclosure
-wood decking made from black locust offer a sustainable wood product from a pioneering tree species, that is capable of with-standing levels of water inundation
-tables and chairs are placed along the 3 levels of wood decking,
-wood stairs lead down into the space

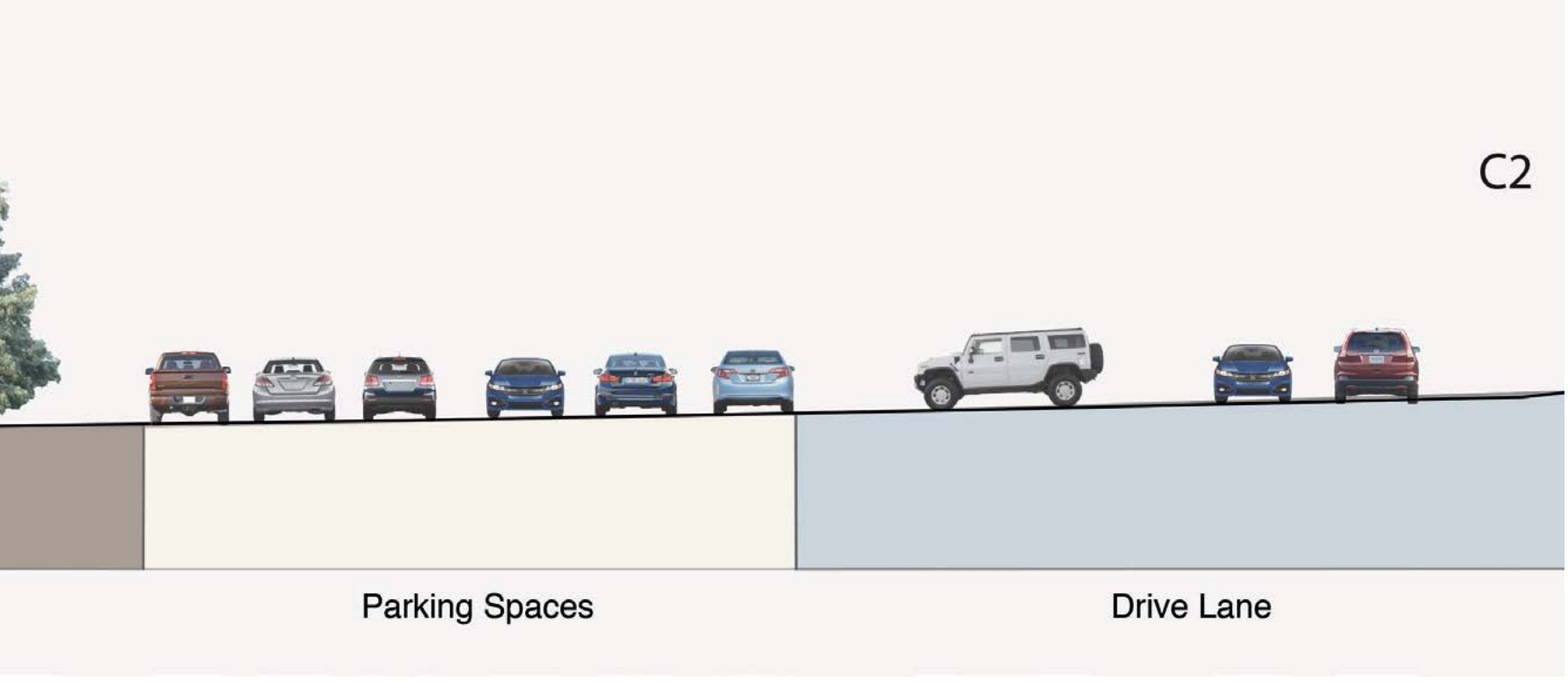
Lower Room Plan



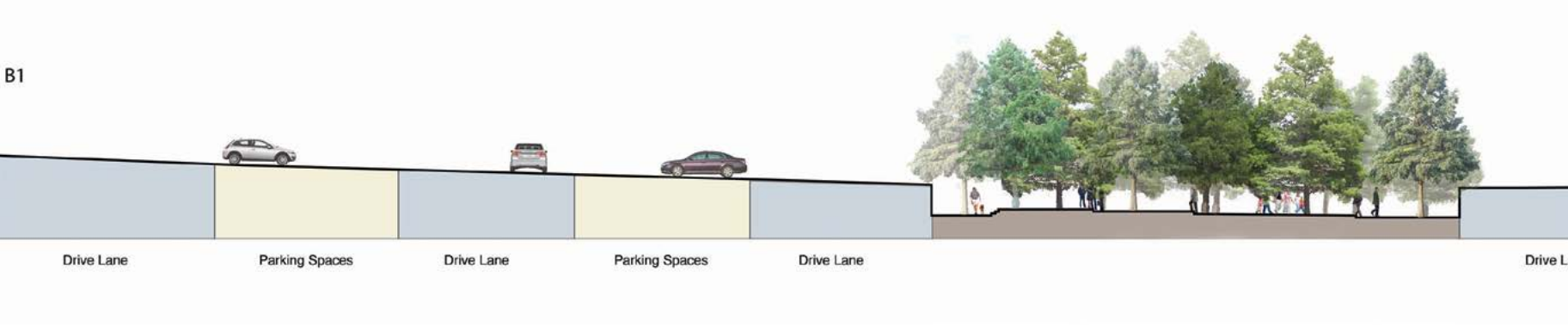
-green rectangles indicate areas with moveable tables and chairs.
-bald cypress trees are grown inside the decking area to provide shade.
-the lowest level inside, the gray area, is 7’ deep.
-the deck raises 6” to 12” to 18” above the gravel area from right to left, the darker decking area being closer to the viewer.
-cantilevered corten steel benches blend into the retaining walls.

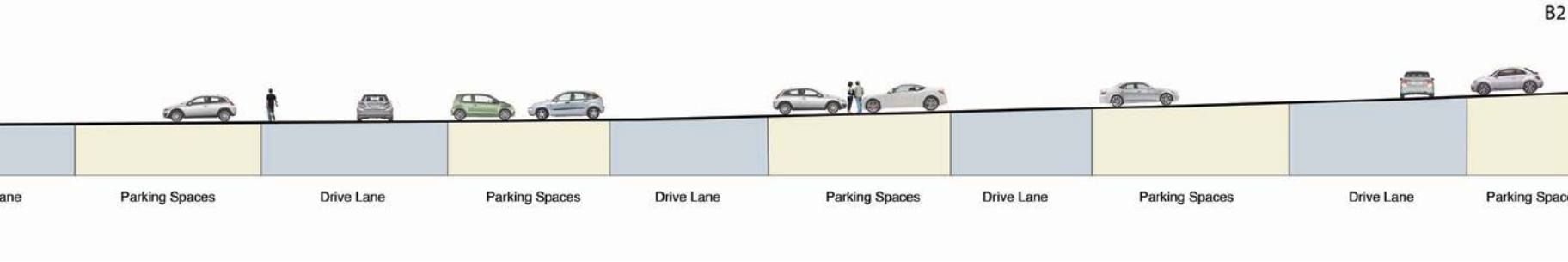
Lower Room Section 1




C2
Parking Spaces
Drive Lane

Lower Room Section 2




B2
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Parking Spaces
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Parking Spac

conclusions and reflections

This thesis study has broadened my awareness to the multitude of impervious surfaces that surrounds us. After looking at some of the fine work by landscape architects to animate and create more socially, economically, and ecologically performative spaces, it is clear that with good intentions from the design world positive transformations could occur through impervious surface adaptations and transformations. Deductive reasoning, informed by successful case studies aligning with my thesis goals, gives theoretical power to the idea of subterranean spaces working effectively in Auburn or anywhere. Moving forward, I hope to one day be involved in a project that includes some of the ideas I have developed here.

If I were to continue my study of this thesis, I would first advance the technical aspects of hydrology and phytoremediation. Within the site boundaries, I would address the practical application of water's entry and flow through these spaces. I might think about incorporating a permanent circulating water feature to accentuate the sensorial experience. The piped creek bed that runs underneath but through the site would be explored with the option of exposing it within the lower sunken room. Safety issues, ADA certified ramps, and maintenance regimes would need to be addressed in detail. I would explore how the shopping center merchants could capitalize on these spaces for daily use, increasing economic opportunties. Last, I would research ways in which organizations and private individuals might arrange rental opportunities to rent the space for their own use.

bibliography

Belanger, Pierre. The landscape urbanism reader. New York: Princeton Architectural Press, 2006.

“City of Auburn | Comp Plan 2030.” City of Auburn | Comp Plan 2030. http://auburnalabama.org/CompPlan2030/Default.aspx?PageID=248 (accessed April 28, 2014).

Corner, James. Recovering landscape: essays in contemporary landscape architecture. New York: Princeton Architectural Press, 1999.

“EOA Links.” Encyclopedia of Alabama: Piedmont Upland Physiographic Section. http://www.encyclopediaofalabama.org/face/Article.jsp?id=h-1309 (accessed April 28, 2014).

Historic Fourth Ward Park // Atlanta BeltLine. https://beltline.org/parks/historic-fourth-ward-park/ (accessed April 26, 2014).

Joseph, Eran. ReThinking a lot: the design and culture of parking. Cambridge, Mass.: MIT Press, 2012.

Karvonen, Andrew. Politics of urban runoff nature, technology, and the sustainable city. Cambridge, Mass.: MIT Press, 2011.

“Michael Van Valkenburgh Associates, Inc..” Michael Van Valkenburgh Associates, Inc.. http://www.mvvainc.com (accessed April 28, 2014).

“Lingotto Factory Conversion.” Renzo Piano Building Workshop. http://www.rpbw.com/project/62/lingotto-factory-conversion/ (accessed April 28, 2014).

“Robert Irwin.” Dia Art Foundation. http://www.diaart.org/exhibitions/introduction/84 (accessed April 28, 2014).

Rogers, Elizabeth Barlow. Landscape design: a cultural and architectural history. New York: Harry N. Abrams, 2001.

Shoup, Donald C.. The high cost of free parking. Chicago: Planners Press, American Planning Association, 2005.

Stamets, Paul. Mycelium running: how mushrooms can help save the world. Berkeley, Calif.: Ten Speed Press, 2005.

Stoss. http://www.stoss.net. http://stoss.net/directus/media/thumbnails/3e6dfb802b71f52f52e8a7580c9d9098.jpg?w=1280&h=1024&c=false (accessed April 28, 2014).

Waldheim, Charles. The landscape urbanism reader. New York: Princeton Architectural Press, 2006.

Wall, Alex. Recovering landscape: essays in contemporary landscape architecture. New York: Princeton Architectural Press, 1999.

Zardini, Mirko. Asphalt. Faculty of Architecture, The University of Hong Kong, 2008. http://fac.arch.hku.hk/event/mirko-zardini-asphalt/ (accessed April 28, 2014).

illustrations

Figure 1
“Auburn University Across Alabama.” Auburn University Across Alabama. http://www.auburn.edu/outreach/auburnacrossalabama/select-county.htm (accessed April 28, 2014)

Figure 2
“.” http://alabamamaps.ua.edu. http://alabamamaps.ua.edu/contemporarymaps/alabama/physical/al_physio.pdf (accessed April 28, 2014).

Figure 3 and 4
“City of Auburn | Comp Plan 2030.” City of Auburn | Comp Plan 2030. http://auburnalabama.org/CompPlan2030/Default.aspx?PageID=248 (accessed April 28, 2014).

Figure 5
“Michael Van Valkenburgh Associates, Inc..” Michael Van Valkenburgh Associates, Inc.. http://www.mvvainc.com (accessed April 28, 2014).

Figure 6
“Robert Irwin.” Dia Art Foundation. http://www.diaart.org/exhibitions/introduction/84 (accessed April 28, 2014).

Figure 7
“Lingotto Factory Conversion.” Renzo Piano Building Workshop. http://www.rpbw.com/project/62/lingotto-factory-conversion/ (accessed April 28, 2014).

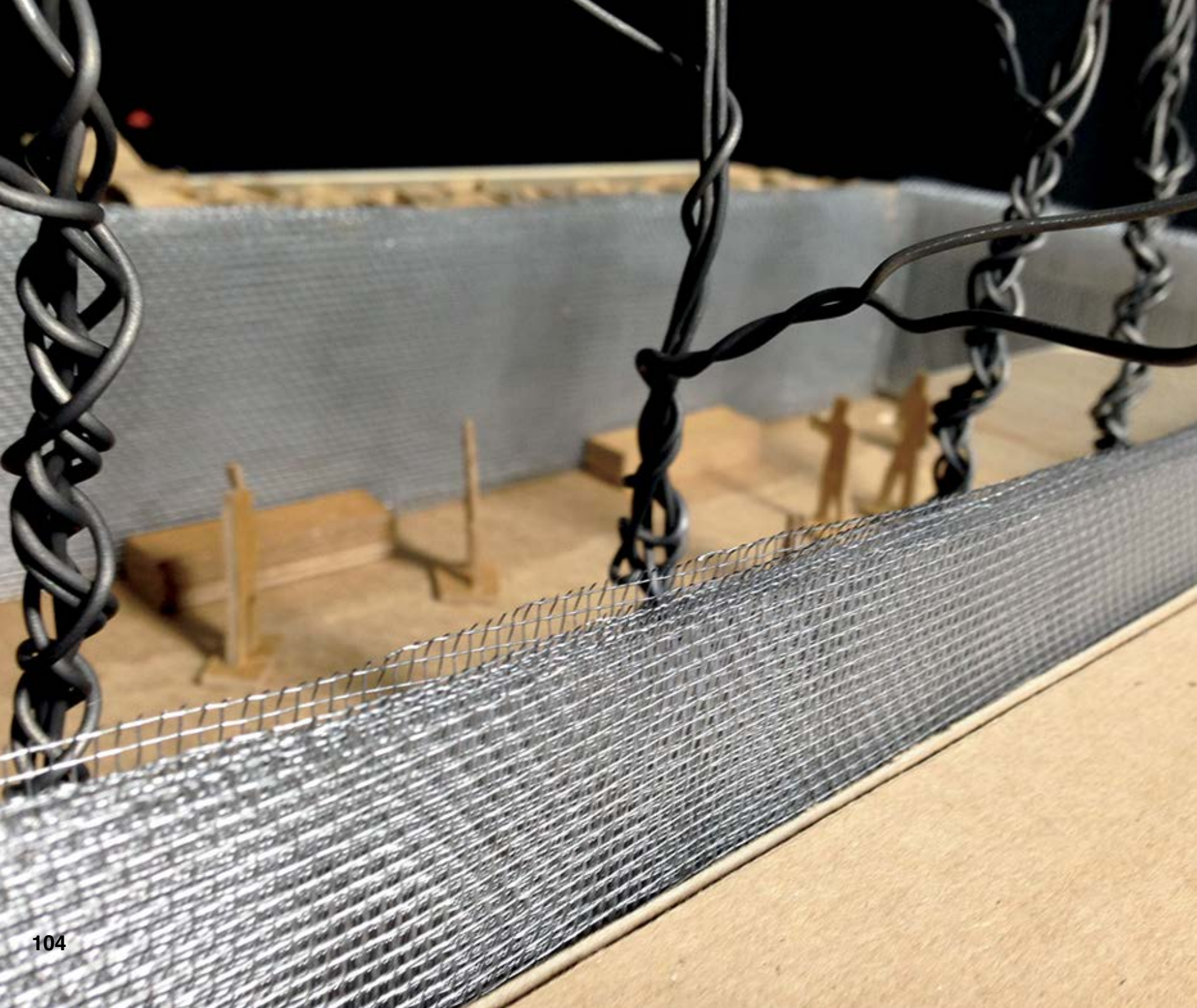
Figure 8
“Bing Maps - Driving Directions, Traffic and Road Conditions.” Bing Maps - Driving Directions, Traffic and Road Conditions. http://www.bing.com/maps/#Y3A9MzIuNTMyOTAyfi04NS41MDc3OTcmbHZsPTQmc3R5PXImcT1hdWJ1cm4lMjBhbGFiYW1h (accessed April 28, 2014).

Figure 9
“MAP.” Historic Fourth Ward Park // Atlanta BeltLine. https://beltline.org/parks/historic-fourth-ward-park/ (accessed April 26, 2014).

Figure 10
“.” http://www.stoss.net. http://stoss.net/directus/media/thumbnails/3e6dfb802b71f52f52e8a7580c9d9098.jpg?w=1280&h=1024&c=false (accessed April 28, 2014).

Figure 11
“.” . http://ad009cdnb.archdaily.net/wp-content/uploads/2011/08/1312334626-stoss-erie-132-12-528x351.jpg (accessed April 28, 2014).

Figure 12
Stamets, Paul. Mycelium running: how mushrooms can help save the world. Berkeley, Calif.: Ten Speed Press, 2005.



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