



# Urban Paths

Thesis by Aaron Grunwald

# Creating Positive Change

A Design Thesis Submitted to the  
Department of Architecture and Landscape Architec-  
ture of North Dakota State University

By

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# Abstract

The typology for this thesis project will be a hybrid transit center. Public awareness on the effects that vehicles and buildings have on the environment is a large component to this project. This will be done through a design that utilizes regenerative ideas as well as exploring the importance of pathways and networks.

Users of this building will range from large and small communities of surrounding regions as well as the heart of Madison.

# Problem Statement

How can regenerative architecture generate and influence societal connections through the exploration of networks and pathway?

# I.O.S



## **Typology**

Hybrid transit center

## **The Claim**

Regenerative design through the means of a hybrid transit center can create societal change and rebind connections between people, and with nature.

## **Premises**

Regenerative Design is a solution that does more than just sustain the environment.

Positive change can be achieved through public interaction with regenerative ideas and seeing first hand how those ideas work in the built environment.

Communities will experience positive change by a change in mind set and, in turn, a change in building methods.

## **Theoretical Premise/ Unifying idea**

In order to change the set minds of people, there needs to be an understanding of the relationship of the built environment to the natural environment. This will be done by integrating regenerative design ideas into the heart of downtown Madison by means of a transit center.

Connecting communities on large and small scales through this regenerative transit center will make it possible for users to see and experience first hand the many positive effects it has on the city and the environment.

## **Project Justification**

Connecting Madison to surrounding cities and communities will set a new standard of design for public transportation systems and the theory of architecture, which is meant to educate the public and public policy.

# The Proposal

# The Narrative

The power of people with like mind-sets can change an entire city. There are clear problems with the way the world is developing on a local and global scale, however, solutions to these problem seem to be ignored until the problem is unavoidably right in front of us. The reliance on fossil fuels has created many of these large problems in our time and its use for our cars and buildings greatly contributes to the loss of the environment.

In order to break this reliance, the public needs to be able to see the positive effects that designing with the environment can have. The first step in achieving this objective is to find a way to get the public interacting with these ideas. This will be done by the design of a hybrid transit center in downtown Madison, WI. Creating a transit center in the heart of the city will connect Madison to other cities such as Milwaukee, Minneapolis, and Chicago, and will connect a large number of people and communities. The typology will also include public housing, which, in turn, creates a base of users that will interact with the structure and the systems on a daily basis.

The city of Madison is working on developing a new plan for the downtown area that encourages higher density, improves public transportation, and pushes for sustainability. This hybrid transit center will become a catalyst for the city by pushing regenerative ideas and setting a standard for other developments to continue this contributing idea to the city of Madison.

Making this building regenerative will begin to change the set minds of people and help them realize that smarter non-wasteful ways of building and living can exist. Right now, what it means to be “sustainable” doesn’t have a clear standard and doesn’t stop our reliance on fossil fuels. A true solution to this problem is to design for self-sustaining buildings that give back to the environment and the grid.

In this project, I will explore the different building systems that will be used to coordinate the buildings with the systems of nature. By following insightful guidelines for ecological design, I will carefully consider all aspects of the building to achieve a successful project on all levels. By considering the different communities of people that will be using this building, I will design to meet all of the needs and coordinate them to create thoughtful positive experiences.

# User/ Client Description

The users of this structure can be viewed in three main groups based on different uses for each one. Its impact will affect communities on a regional level as users from other communities will pass through or stop in Madison. On a city level for users moving across town or to the downtown for certain events. And on a local level for those who use this system everyday to achieve their daily activities.



## Program

Ticket Lobby -	5,000 sf
Concourse -	12,000 sf
Loading Platforms -	33,000 sf
Retail -	8,000 sf
Circulation -	5,000 sf
Booking Office -	1,500 sf

## Program Additions

Lake Monona Park -	140,000 sf
Sky Park System -	270,000 sf

# Information



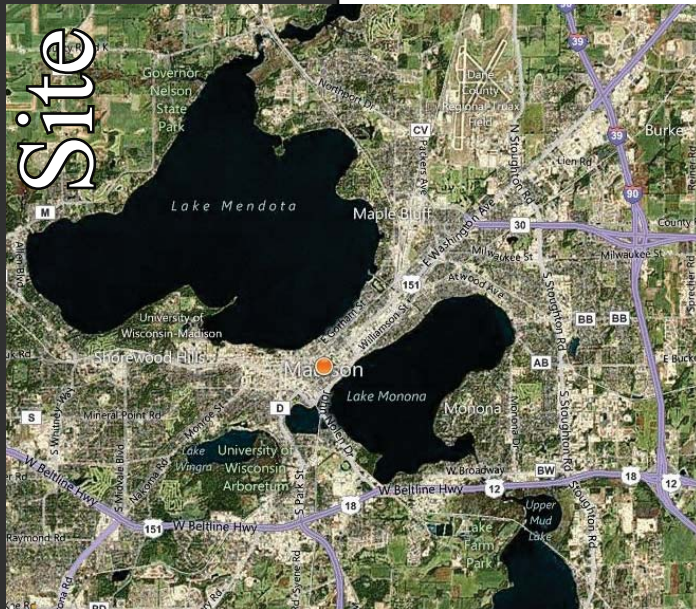
## Region:

Madison is located in the Midwestern United States in the south central part of Wisconsin.

## City:

The City of Madison is located in Dane County, 77 miles west of Milwaukee and 122 miles northwest of Chicago. The city completely surrounds the smaller Town of Madison and the City of Monona, as well as the villages of Maple Bluff and Shorewood Hills. The capital is located on the isthmus between Lakes Mendota and Monona within the Four Lakes region.

# Site



## Site:

The site is located near the center of downtown Madison on the isthmus that divides the lakes of Mendota and Monona. The site will be located over the existing railroad tracks on the lake front of lake Monona. The state capital is just a few blocks to the north west and the Monona Terrace located just to the south west of the site.



# Project Emphasis

This thesis will study the different systems and techniques that designers can use to create buildings that have a positive existence with the environment and the community. Emphasis will be on integrating these systems into a downtown setting and doing so in a way that people can see how these systems work. Focus will also be placed on meeting all of the different needs of the users of the facility.

## **Research Direction**

Research for this thesis will be devoted to understanding regenerative design, systems, and how they can work together with nature. Case studies will also be very important as they will help inform necessary design decisions based on functionality.

## **Design Methodology**

The research for this project will be done following the Mixed Method approach. Quantitative and Qualitative information will be collected throughout the design and then applied to create a well designed and well researched structure.

## **Documentation of Design**

In order to have a successful project, continual documentation of the different sources and media types will be required. For this to happen a digital collection of sketches, drawings and other media types will be submitted in an orderly fashion to ensure complete documentation throughout the project.

## **First Year**

Spring 2007: Stephen Wischer

- Form and spatial studies
- Hand graphics
- Dwelling for introspection

## **Second Year**

Fall 2007: Darryl Booker

- Tea House
- Rowing Club
- Mountain Dwelling

Spring 2008- Stephen Wischer

- Urban Reuse
- Unique Residential

## **Third Year**

Fall 2008- Steve Martens

- Masonry Guild
- Wildlife Research Facility

Spring 2009- Ron Ramsey

- Shaker Barn
- Chicago  
Auto Showroom

## **Fourth Year**

Fall 2009- Bakr Mourad Aly Ahmed

- High-rise design
- KKE Percussion instrument design competition

Spring 2010- Darryl Booker, Frank Kratky, Don Faulkner

- Viable Community-Santo Domingo
- Public School-Africa
- Santo Domingo Housing

## **Fifth Year**

Fall 2010 - Professor Mark Barnhouse

- Water resource experimentation station - Linton, ND





# Program Document

## **What is Regenerative Architecture?**

The current standard today for efficient/sustainable buildings is not an adequate measure for how the future of architecture needs to evolve. Having a “less bad” approach to design doesn’t truly solve any of the core problems. The amount of planning and consideration that go into what effects a building will have on the environment is very low, as are the standards for being “sustainable.” With these current building methods and standards, a building is recognized and seen as a sensible design if it simply begins to take the site and the environment into account. This idea of sustainable design does not push building design and construction methods far enough away from the true problems. Regenerative architecture consists of using the natural world as the medium for and generator of the architecture. It looks at the natural systems and ideas of nature and works with them in a harmonious way.

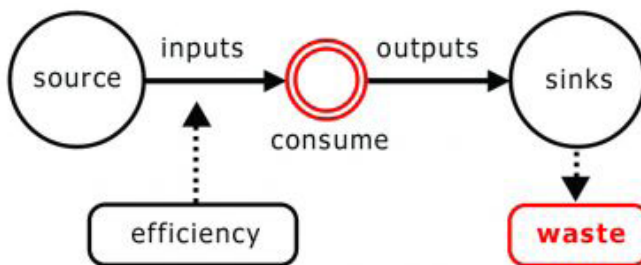
Regenerative architecture focuses on stewardship and performance, as well as working directly with the environment to achieve all of its functions. This is done through the materials used, reduced energy consumption, and thoughtful design. For this design idea to work, it is important to understand how all of nature’s systems work together without producing waste. Regenerative design is based on the premise that everything we build has the potential for the integration of the natural world as a main component to the design.

## Architecture related to place

“The art or science of building; specifically : the art or practice of designing and building structures and especially habitable ones” (Webster, 2009). This definition from Websters dictionary speaks of what architecture is currently. However, it doesn’t address the importance of place. Buildings exist as part of a site that has many distinct and varying characteristics. In order for architecture to exist as one with the site, all details from the building skin to the building systems need to be designed in a way that works with, not against, the environment. The definition of architecture needs to be modified so that the building and the site are viewed as one.

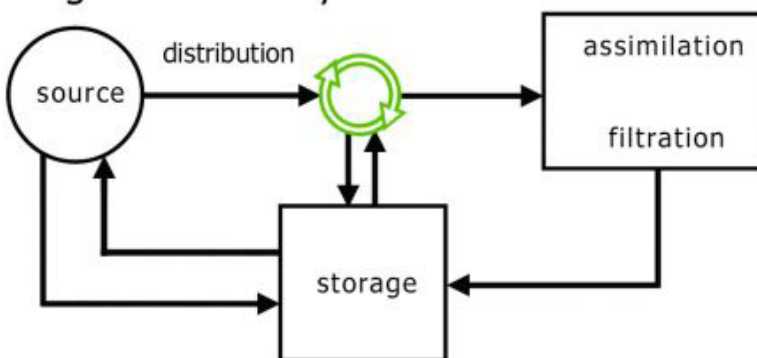
Below is a graphic that explains the over all cycle of systems in use today and how regenerative systems work. As clearly shown in the graphic of existing systems, efficiency is the number one focus and the output of waste is of little concern. This method of thinking is the root problem to the way that almost everything is done. Sustainable ideas begin to lower inputs and lessen consumption, but do not eliminate the problem of waste. In the regenerative model, the idea of waste is removed as it is a closed loop system.

### Existing throughput systems



- Efficiency as end goal
- Degenerative linear flows

### Regenerative systems



- Effectiveness as end goal
- Within renewal capacity
- Integrate with natural processes
- Symbiosis
- Closed loop system
- Multiple pathways

## **Why being Sustainable isn't enough.**

Traditionally green, or sustainable buildings, focus only on the first aspect of regenerative architecture. That is, it uses technology as a way to reduce and conserve energy. It is easy to draw parallels between the rise of hybrid cars and these sustainable structures. The hybrid car is the auto industry's answer to how they contribute to saving the environment. However, while the technologies being used reduce the impact of cars on the environment, it is still burning fossil fuels. With oil drilling almost at its peak and prices rising, continuing to use fossil fuels as a sustainable mode of personal transportation is not the answer. Architecture is using this same flawed logic. While it is good to reduce consumption of fossil fuels, it is necessary to consider alternative renewable energy sources.

Mitchell Joachim, ecological designer and professor of architecture at Columbia University, says this about sustainability in a Wired Magazine interview, "I don't like the term. It is not evocative enough. You don't want your marriage to be sustainable, you want it to be evolving, nurturing, learning. Efficiency doesn't cut it either it just means 'less bad'" (Wired, Vanderbuilt, 2008).

The ideas of regenerative architecture have been around for many years, but with so much money invested in oil, these ideas have been pushed aside. We need to look at how a structure can produce energy, food, collect water, purify water, produce oxygen, and capture CO<sub>2</sub>. Buildings have the capability to have these systems integrated into them and this could enable them to truly have a positive existence in the world.



Bill Reed speaks about the unnatural building systems used in structures in his 2006 article “Shifting our Mental Model- ‘Stainability’ to Regeneration.” He states, “We primarily see systems, and systems’ thinking applied to closed systems such as mechanical systems, envelope systems, and so on. These human designed systems are entropic by nature, requiring a continuous infusion of resources and energy to sustain themselves” (Reed, 2006).

As there are a finite amount of resources in the world, this “continuous infusion of resources” is not a sustainable solution by any means. We need to realize that technology itself is not going to solve all of these issues, unless it is technology that works together with the environment. Once regenerative ideas begin to become accepted, the possibilities become almost endless.

William McDonough, a prominent architect, developed a set of guidelines that were created for the World Exposition in Hanover, Germany in 2000 called “The Hannover Principles.” These principles suggest a model for designing based on Earth, Air, Water, and Spirit and the concept that humans must coexist with nature. These principles describe the dependence that humans have with the natural world, which include the effects of our designs on the viability of ecosystems.

## **The Hannover Principles**

1. Insist on rights of humanity and nature to coexist in a healthy, supportive, diverse, and sustainable condition.
2. Recognize interdependence. The elements of human design interact with and depend upon the natural world, with broad and diverse implications at every scale. Expand design considerations to recognize even distant effects.
3. Respect relationships between spirit and matter. Consider all aspects of human settlement including community, dwelling, industry and trade in terms of existing and evolving connections between spiritual and material consciousness.
4. Accept responsibility for the consequences of design decisions upon human well-being, the viability of natural systems, and their right to coexist.
5. Create safe objects of long-term value. Do not burden future generations with requirements for maintenance or vigilant administration of potential danger due to the careless creation of products, processes, or standards.
6. Eliminate the concept of waste. Evaluate and optimize the full life-cycle of products and processes to approach the state of natural systems, in which there is no waste.
7. Rely on natural energy flows. Human designs should, like the living world, derive their creative forces from perpetual solar income. Incorporate this energy efficiently and safely for responsible use.
8. Understand the limitations of design. No human creation lasts forever and design does not solve all problems. Those who create and plan should practice humility in the face of nature. Treat nature as a model and mentor, not as an inconvenience to be evaded or controlled.

All of these principles are instrumental in thinking about regenerative architecture. The Hannover Principles as well as The Five Principles of Ecological Design layout the foundation for a new model of thinking. Working through these design guidelines as well as others learned along the way a project that works with the environment should be achievable.

Another important set of design guidelines was put forth by two of the most influential practitioners and researchers in the field of Ecological Design, Sim Van Der Ryn and Stuart Cowan, in their article “The Five Principles of Ecological Design.” They speak of the importance of place and how the design of structures and systems should complement the natural world. They state “the more seamless these factors are integrated into the design, the less our activities detract from the health of nature” (Van Der Ryn and Cowan, 1996). They further explain their ideas about the importance of place by stating, “Ecological design occurs in the context of specific places. It grows out of place the way the oak grows from an acorn, It responds to the particularities of place: the soils, vegetation, animals, climate, topography, water flows, and people lending it coherence” (Van Der Ryn, Cowan, 1996).

## The Five Principles of Ecological Design

1. Solutions Grow From Place. Ecological design begins with the intimate knowledge of a particular place. Therefore, it is small scale and direct, responsive to both local conditions and local people. If we are sensitive to the nuances of place, we can inhabit without destroying.

2. Ecological Accounting Informs Design. Trace the environmental impacts of existing or proposed designs. Use this information to determine the most ecologically sound design possibility.

3. Design With Nature. By working with living processes, we respect the needs of all species while meeting our own. By engaging in processes that regenerate rather than deplete, we become more alive.

4. Everyone is a Designer. Listen to every voice in the design process. No one is only a participant or designer. Everyone is a participant-designer. Honor the special knowledge that each person brings. As people work together to heal their places, they also heal themselves.

5. Make Nature Visible. Denatured environments ignore our need and potential for learning. Making natural cycles and processes visible brings the designed environment back to life. Effective design helps to inform us of our place within nature.

## **Providing for the many users.**

### **Regional**

As the rail line for this thesis extends past Madison to the cities of Minneapolis, Milwaukee, and Chicago, it is important to look at the needs of users on a regional scale. Users such as those on business trips who may be in Madison for a day or a week will need to have services provided for them such as food, lodging and further transportation available to them when they arrive at the transit center.

### **City**

Users from near cities, or those living outside of downtown will have specific needs as well. Someone who would take the train into the city everyday for work would need to have the systems operate in a way that makes this as easy and reliable as possible. If it is not convenient or practical enough, people will be deterred from using the public systems and resort to driving instead.

### **Local/Site**

For those who live near the site in the downtown area, or even live in the vicinity a very direct connection is needed. These users will daily rely on the system to achieve their everyday activities. The design must be practical and fluent enough that these needs, as well as all of the users' needs, are met and work in unison with one another, just as the building must work in unison with the environment.

In my research I studied what has been seen as sustainable in the past and the shortcomings that these buildings have. While increasing sustainability is a positive step from what buildings have been in the past, it is not the complete solution. These green buildings are beginning to solve some of the important issues, but are passing by some of the larger concerns.

The design guidelines from William McDonough, Sim Van Der Ryn and Stuart Cowan all bring very important ideas to consider and incorporate into my design. These thoughtful designing strategies are the key to creating architecture that reaches past sustainability, and could create a brighter outlook for the future.

## **Designing for place**

The first step that needs to be taken is a complete look at the site and the natural systems that are already in place. This applies both on a level of the site as a place, as well as the people and spirit of this place. The use of the different programs involved and how people will interact with them daily is part of this cycle that needs to be integrated with the cycles of nature.

## **Design with nature**

Once these environmental and human cycles are identified, the systems need to work together as a partnership. The systems should work with nature in a way that borrows from and also gives back, but always respecting to the other.

## **Eliminate Waste**

To design for a regenerative building, you must remove it from the rest of the city grid. Once you begin to think in this way, it is easy to pin-point all of the systems that need to be designed. How will the building filter water, what will happen with the water after it cycles through the building? How will power be produced and stored...? Once the building is thought about as a closed loop system, the idea of waste can be eliminated and seen as a contributing element.

## **Connecting communities**

As there will be a large amount of users, some that will use it daily and some that will only use it once or twice, the building must accommodate the needs of each of these different groups. It is important to take a look at these individual needs and develop solutions that encompass all of the requirements as completely as possible.



# Case Study 1

## Typological Research

Santiago Calatrava

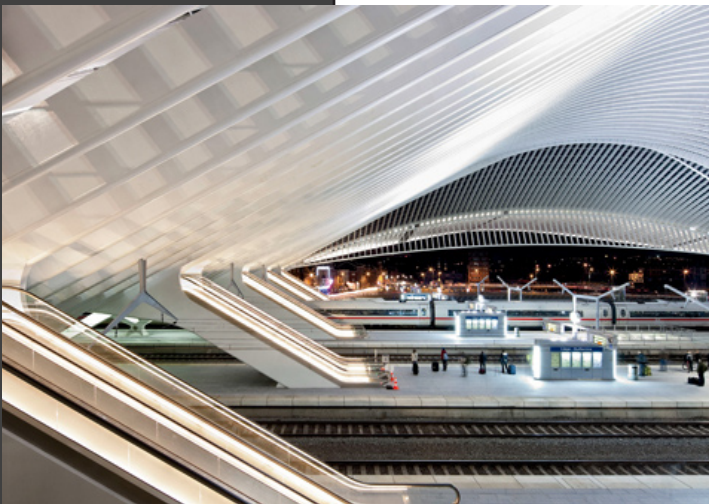
Liege-Guillemins TGV Railway Station  
Liege, Belgium

In 1997 Santiago Calatrava was selected to design a new light rail station in the historic town of Liege. The station occupies 527,000 sf, with a spectacular roof structure that spans the entire space. The state of the art roof design 115 feet at its highest point over the nine tracks and five platforms below.

The steel and glass roof assembly floods natural light into the station, creating a truly unique experience. During the roof construction of the new design, the old station was still in use. Because of this, a new construction method was used to assemble the roof without disturbing the tracks below. All together the roof is comprised of 39 ribs that span 518 feet to cover the length of an arriving train.

This building is tailored specifically to trains where-as the thesis will have multi functions, but the key organization elements are useful to note. The ground level hosts all of the train station functions with a clearly organized system. Beneath these tracks are 10 pod-like shops that are integrated into the substructure. This design integration is a great example of how to use all of the space in a useful way and to fulfill the needs of the users.

This case study clearly shows the necessary elements needed for a well functioning railway station. However, it doesn't incorporate many of the ideas for the thesis design, such as green ideas or other means of transportation.



Images from Minutillo, 2010

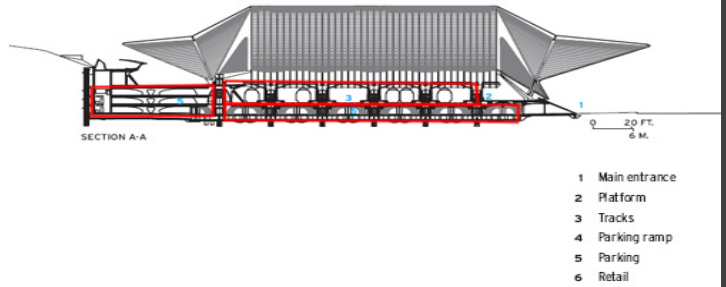
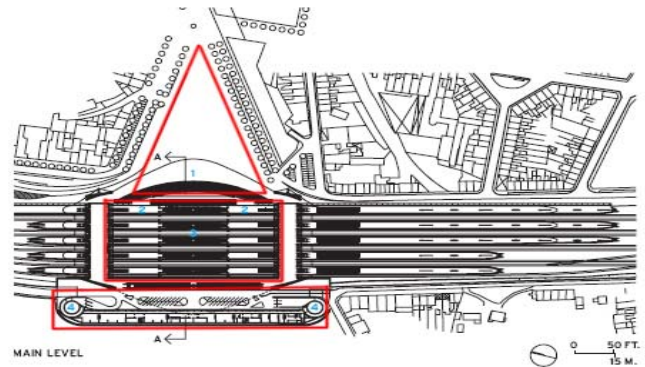


# Analysis

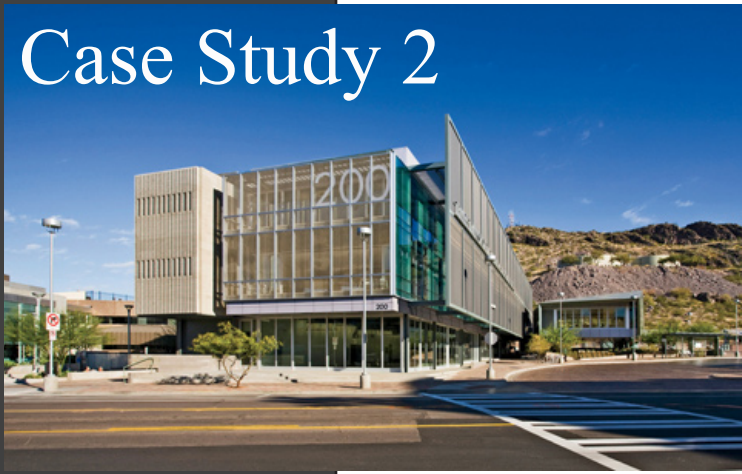
The structure of the rail station is truly impressive, creating a unique and exciting space for people to experience on a daily basis. With such an open space, it is easy to see and understand the simple organization patterns and the way that the building functions. However, this bright white structure deeply contrasts the old historic setting of the site

When viewing this building in section, you are able to see the robust structure under the tracks and understand how the retail spaces are positioned in the voids. The absence of an exterior facade creates a complete view of the city, as seen in the picture on the left. The way that the structure engages the site is very apparent in the plan view, and the simple openness for the building and the site make it easy to understand. The sleek and streamlined look the building takes on when viewed in elevation speaks to the function and identity of these light rail trains.

The massive spanning roof structure creates a truly unique setting for a train station, one that is unlike any station before it. Innovative and grand spaces such as this are very effective when trying to attract people to visit or use the station. The more inhabitable and enjoyable a space is, the more likely people will want to come and use it.



## Case Study 2



Images from McKnight 2010

## Typological Research

Otak

Tempe Transportation Center  
Tempe, Arizona

The Tempe Transportation Center originally was going to strictly be a bus terminal, but with growing support for a purposed light rail it evolved into a much greater development. The building became a multi story design that hosted offices for the city's transit division, leasable commercial space, a community room, and an indoor bike garage with shower facilities. The 40,300 sf multistory building offers many services to the multitude of people that use the facility and has applied to receive the LEED Platinum award.

The building utilizes many large operable shading devices to control the amount of light and heat gain. Other features that this building utilizes in order to be more sustainable are green vegetated roof, under floor air distribution system, operable windows, and retractable sun shades.

Ground Floor

Includes retail, transit store, security office, and bicycle cellar (with bike repair and accessories).

Second floor

Includes the city of Tempe Transportation Office and Don Cassano Community Room.

Third floor

Houses the Transit Operations Center.



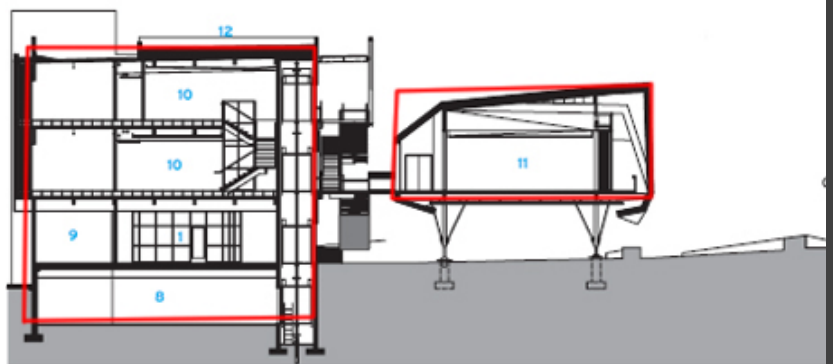
# Analysis

When looking in plan view at how the main functions are organized, it is easy to see that the layout was very site driven. The perimeter of the site is lined with the three main components, leaving the central space free and creating an open connection to all three.

Because space was so limited, the decision was made to build vertically. When looking at the section, you can see how a shaded exterior space was created by lifting the community room off the ground. Design solutions like these will be important to keep in mind as the site in Madison will have limited space as well.

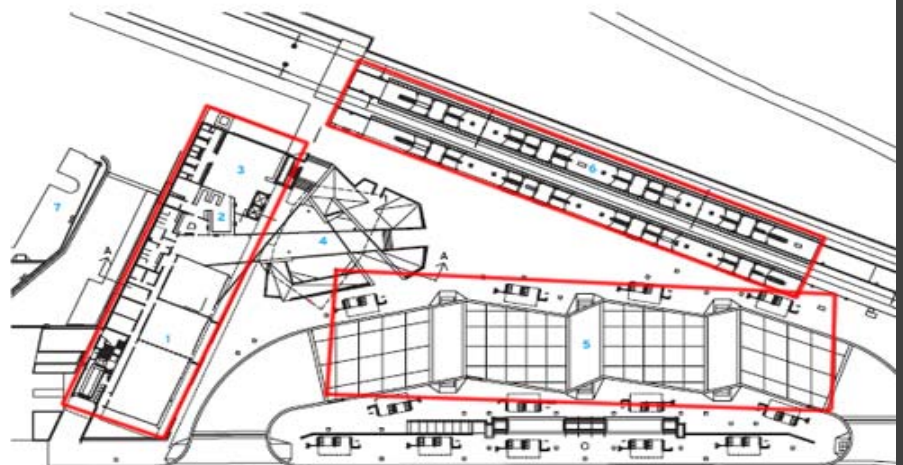
The strengths of this design are its integration into the many communities. Because of its multi-functions, the design is able to reach out to many different groups of people. This is important because in order to get the public to change its mind about public transportation and light rails, they need to interact with it on a regular basis. For this reason, the thesis will include public housing, which will help create a base of people that will use such systems on a regular basis.

A few of the main useful elements of notes taken from this case study are the methods of integration. The ability to have a fairly small site and have a bus and train station exist, as well as other public services such as the bike garage. Because the site is in downtown Madison, space will be limited and efficient ways to use it will be a focus of the design.



SECTION A-A

- |                           |                      |                   |
|---------------------------|----------------------|-------------------|
| 1 Retail                  | 5 Bus terminal       | 9 Services        |
| 2 Ticket counter/security | 6 Light-rail station | 10 Offices        |
| 3 Bike storage and repair | 7 Police station     | 11 Community room |
| 4 Shaded plaza            | 8 Mechanical         | 12 Green roof     |



GROUND FLOOR

0 30 FT.  
9 M.

# Case Study 3

## Typological Research

William McDonough + Partners

Adam Joseph Lewis Center for Environmental Studies  
Oberlin College, Ohio

### Program

Classrooms, offices, atrium, & auditorium  
Area  
13,600 square feet



The fundamental building principles that this building operates on are the same that will be used in the thesis. These principals are to eliminate the concept of waste, rely on natural energy flows, and honor diversity. The building's spacial layout was all thoughtfully designed to achieve as much natural assistance from the environment as possible. The light-drenched, two-story atrium serves as the primary organizing space while acting as the southern campus's town hall. Day lighting and natural ventilation enhance the atrium's feeling of an outdoor room as well as its role as the building's physical and social center. In 2006, the site became a net energy exporter, producing 30 percent more energy than it needed to operate and sharing this excess energy with the community.



To minimize water consumption, the Lewis Center employs a water treatment system it named “The Living Machine.” As the system takes in wastewater, the machine treats and purifies the water so that it can be reused for toilets. The curve of the roof allows for this building to absorb large amounts of the sun’s energy throughout the day. Whenever this system provides more energy than it needs, the local power company purchases the surplus of electricity. Sensors are also integrated to detect sunlight and movement that regulate lights so as to avoid unnecessary use.

## Analysis

The geometries of the building are all in response to the effects that the environment will have on them. The section shows how spaces are opened up to allow light to penetrate all the way into the building in the cold winter months, and how the curved roof provides an overhang for shading in the summer.

The seamless integration of systems, as was mentioned in the research portion, is very well done in this case study. The natural shading devices and the photo voltaic panels of the roof are easiest to note. More difficult systems such as “The Living Machine” are also integrated well into the structure. The pond that exists to support this system also adds opportunity for plant life to grow on site that would maybe not be present otherwise. This is a great example of ecological design.



Transportation centers are striving to be more “green” than they have been in the past. This is a good trend to see as it is the beginning steps towards truly being “environmentally friendly.” Transportation centers are also evolving to be much more multi-use structures. There used to be a train station, and then a bus station... all being there own structure. It seems that now these functions are being integrated into a one stop user friendly structure.

Along with these more susitainable buildings, other multi functions are beginning to appear. Incorporating a bike garage is a step in the right direction by giving people options other than the car. Integration is really the key term when looking at these case studies. Integration is a main component that will need to be carried through this thesis on multiple levels. These case studies have informed me as to how sustainable and multi-functional ideas are being achieved. However, integrating the building with the systems of nature to create a positive effect on the environment will indefinitely become the hardest problem to solve.





Calatravas' design of the light rail station leads me to look for solutions that are not traditionally considered. It will be vitally important to keep an open mind when designing and to not rule out solutions because they aren't the traditional method.

The case study on the environmental studies building was very useful because it shows that these sort's of regenerative systems are beginning to be put in place. The living machine that they came up with helps to naturally solve some of the unavoidable issues with the built environment. The solution for the proposed thesis will be a hybrid of these systems of regenerative design.



## How We Develop

Driving through any suburbs of a city when in America, it is easy to see how we are developing. Everyone wants to achieve the American dream and have their own space complete with a backyard and a connected garage. The obvious results of this are the endless rows of identical housing, distinguishable only by the style of mail boxes. It is clear that this isn't the most environmentally friendly method of development, and it is important to see the large scale problems with these methods.

Many Americans are completely fine living in this type of housing development. Their community is defined by the stone wall or wooden fence separating them from the highways and the rest of the world. The large two stall garage enables them to travel personally straight from their home to office without ever interacting with the rest of the world. So why do we continue to develop in this way?

Money is at the forefront of this problem and respect for the environment takes a back seat.

Developers are in the business to make money. This type of development offers the least amount of risk with the quickest turnaround time on their initial investment. When these plots of land are built all at once with multiple houses the necessary time and money are reduced to have variation from one to the next. There is no incentive for them to create quality developments and thus it is impossible to expect them to act differently. The cost of obtaining new land to build on is less than that of building higher densities, as a result, it is good business to make sprawled out developments that eat up precious natural land and form the heart of urban sprawl.



## How we construct our buildings

Many of the problems with how we build our buildings can easily be linked to our development patterns. A direct consequence of building tract homes in masses is that each home cannot be customized specifically to work with the natural topography and orientation of the site. A comfortable indoor climate could be achieved in most climates simply by designing and placing the building with an appropriate solar orientation. Instead of doing this, we simply force our buildings to work on any site, any climate, and any orientation provided we outfit it with a robust enough HVAC system. In addition, these massive developments are not conducive the fostering a sense of individuality. If a feeling of individuality can be achieved, a sense ownership and pride will grow within homeowners. Another problem related to this mass development is that the majority of buildings are built with a quick profit in mind and thus tend to be built very cheaply. Here are three of the different outcomes that usually arise from these building styles.

1. The home owner will be forced to constantly fight to prevent his home from falling apart. He will be forced to put large amounts of money into repairs to keep his home habitable. This will be a constant struggle that results in tremendous amounts of wasted money.

2. Homes are left to decay and need to be demolished once their lifetime has expired. This creates enormous amounts of waste and lost money. These homes are demolished within the natural time period they were built to stand, resulting in a positive outlook only from the developer's point of view. The next people to develop the site will most likely do so in the same manner as the initial developers. This ongoing cycle of wastefulness insures future life for more cheap developments.

3. A new trend has appeared over the past 50 years that really hasn't been present in U.S. history. New to the post World War II baby boomer generation is the fact that we tend to be less tied to our homes and home cities. We have become a transient society with little emotional investment in the places we live, which is directly related to, the third possible outcome. Homes will be lived in with the original owners until they are paid off, which will generally coincide with them falling apart and decaying. Once this point hits, a mass exodus from these once middle class – semi affluent neighborhoods takes place and leads to their transformation into slums and ghettos. These places are poor living environments that foster poverty and hopelessness, which leads to crime and social emptiness. This will become the natural progression, only to happen again once the original owners leave to newer developments on the outskirts of sprawl infested areas.

The other problem with the way we build is directly tied to economics. We create buildings with the materials that help us achieve our more-often-than-not tight budgets. The problem with this is that the most affordable materials tend to be those that also happen to have the greatest cost on the environment. It is nearly impossible to convince people to expand their budget to save a few trees. People need to be educated on the money and environment saving options available so that they can see their usefulness. Once these ideas are adopted on a small scale, change will start to occur. Madison's new downtown plan is to create higher density areas and to push green ideas in signature buildings, such as a transit station, to serve as a catalyst for future growth.

## Energy Consumption

The buildings that we construct are one of our greatest energy consumers. This great thirst for energy means that buildings that are designed should be obligated to produce a portion of the energy that they consume. Technology and innovation has made efficient energy production processes available on a small enough scale to make this possible. The largest barrier right now is the mind-set of the building owners and architects who don't completely understand all of the energy options available. It is difficult to convince a building owner to put up the initial investment that will be paid off over a relatively long period. Architects are in the unique position to help change this mind-set of their clients and encourage the integration of renewable energy generators.

## History of Madison, WI

The City of Madison was founded in 1836, when former federal judge James Duane Doty purchased over a thousand acres of swamp and forest land on the isthmus between Lakes Mendota and Monona within the Four Lakes region with the intention of building a city on the site. The Wisconsin Territory had been formed earlier that year and the territory's capitol had yet to be decided. Doty lobbied aggressively for Madison to be named the capital and offered choice land for those who voted for it. Doty named the city Madison after James Madison, the fourth president of the United States who died June 28, 1836. He also named the streets after the other 38 signers of the U.S. constitution. On November 28, the territorial legislator voted Madison as its capitol.

The cornerstone for the Wisconsin capitol was laid in 1837. Wisconsin became a state in 1848, and the following year it became the host to the University of Wisconsin - Madison. It became a city in 1856 with a population of 6,863. During the civil war Madison served as the center of the Union Army in Wisconsin. Camp Randall, located on the west side of Madison, was built and used as a training camp, a military hospital, and a prison camp for captured Confederate soldiers. When the war ended, the site was absorbed into the University of Wisconsin and is currently the site of Camp Randall Stadium.

## Downtown Madison

Downtown Madison has experienced many positive changes since the 1980s, when the last downtown planning effort was underway. A new Downtown Plan will set the stage for the new ideas and direction for the city. Although it has been over twenty years since the last comprehensive plan was written for the Downtown, much planning has occurred, including several neighborhoods, small areas, and large plans such as a new high speed rail station.

The purpose of the new plan will be to describe the desired future for downtown development and provide a framework to help achieve it. It will establish a decision making framework to ensure that incremental decisions are made over time.

### **VISION**

“Downtown Madison will be a flourishing and visually exciting center for the arts, commerce, government and education. It will be a magnet for a diverse population working, living, visiting and enjoying an urban environment characterized by a sensitive blending of carefully preserved older structures, high quality new construction, architectural gems, and engaging public spaces all working together and integrated with surrounding neighborhoods, parks and the transportation system to create a unique and sustainable environment for the community, the region, and beyond” (City of Madison,2010).

## Thesis Goals

1. To create a theoretical premise and unifying idea that brings attention to an important issue and to create a project that suggests change.
2. To obtain knowledge of the topic and be able to create a complete thesis that serves as a solution to the theoretical premise.
3. To complete a schedule that challenges me, and encourages thorough completion and understanding of all design elements.
4. To complete thorough documentation of the thesis in order to provide useful and interesting information to those who wish to learn about the subject.

5. To create a design solution that embraces the social and cultural needs of a changing society.

6. To create a final presentation with graphics and drawings that clearly communicates the thesis ideas and solutions to the audience.

7. To create a clear and professional compilation of all research, documentation, and design into a final document accessible to future designers.

8. To create a final thesis that shows all of the knowledge that I have gained over the years of my education at NDSU.



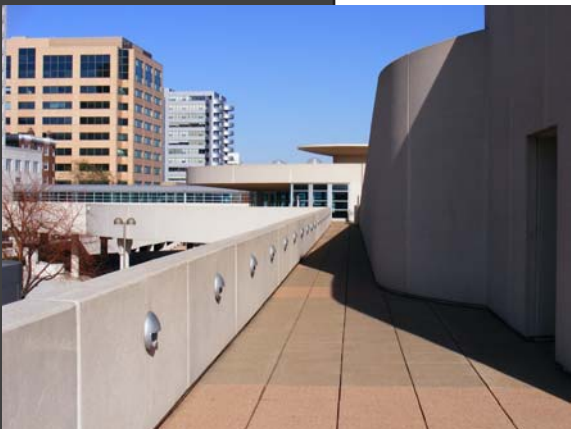
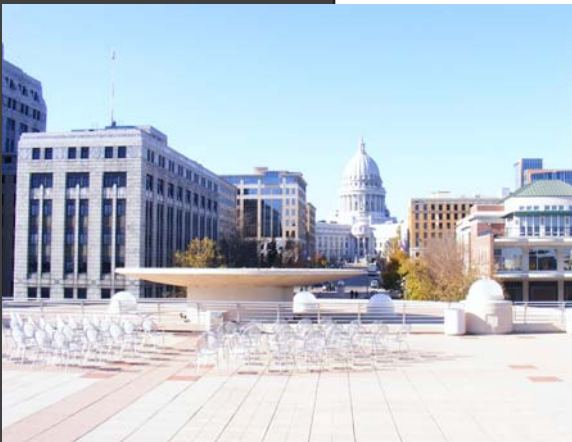
# Narrative

## VISION

**“Downtown Madison will be a flourishing and visually exciting center for the arts, commerce, government and education. It will be a magnet for a diverse population working, living, visiting and enjoying an urban environment characterized by a sensitive blending of carefully preserved older structures, high quality new construction, architectural gems, and engaging public spaces all working together and integrated with surrounding neighborhoods, parks and the transportation system to create a unique and sustainable environment for the community, the region, and beyond” (City of Madison,2010).**

Downtown Madison was chosen as the site for this project because of its diversity and rich history. The downtown area is organized in a way that one is able to understand the key elements of the city. The capital is clearly the main element as streets form views and clear patterns for many blocks surrounding it.

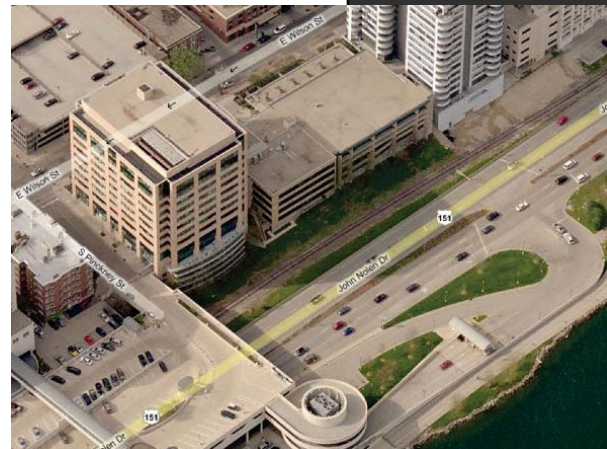
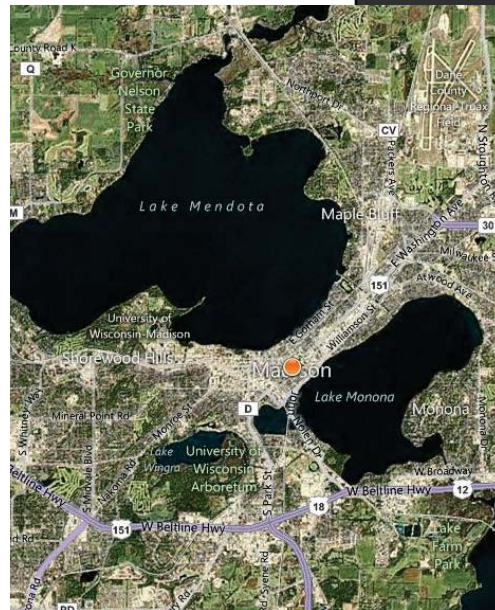
As stated above, the City of Madison is in the process of writing a new plan for the future of Madison that has many positive goals and outlooks for the future. Because of these goals, I felt that this was the perfect location for a regenerative thesis design, and a transportation center was the ideal typology to achieve it.





# Site Analysis

The site selected to host this project is located very near lake Monona, just off of John Nolen Dr. The location of the site gives the transportation center a deep integration into the downtown and a central connection to the city of Madison. The site is surrounded by buildings about twenty stories in height and mostly residential living. The isthmus that the capital is perched on actually has a notable slope to it, but the building height requirements of Madison are set so that you cannot build higher than the capital. As a result, developers build up to that limit, meaning the developments right on the lake are taller because of lower elevation, but the skyline is all the same height.



## **Soil**

A bit over 40 percent of Wisconsin's soil are classified as alfisols. This type of soil is rich in clay content, has very little acid and is the soil located at the site.

## **Utilities**

Because the site is located in a city, there are plenty of utilities to be found. The utilities in the area are all located underground. The goal of this project will be to use none of them

## **Vehicular traffic**

John Nolen Dr is located directly to the south of the site and is a high traffic road. While the road to the north is not nearly as busy, it is still a busy downtown road.

## **Pedestrian traffic**

Pedestrian traffic is much denser to the north of the site away from the busy street and the railroad tracks. The Monona terrace is to the east of the site and the majority of pedestrian traffic will be coming from this direction.

## **Topography**

The isthmus has a slope to it that peaks at the capital and slopes down on either side. The site itself only experiences a slight slope, but one that still needs to be considered.

## **Site character**

The site character is one that speaks transportation, as it is located on rail road tracks and further contained by roads. There are uninterrupted views of the lake to the south, which will enable direct solar gain.



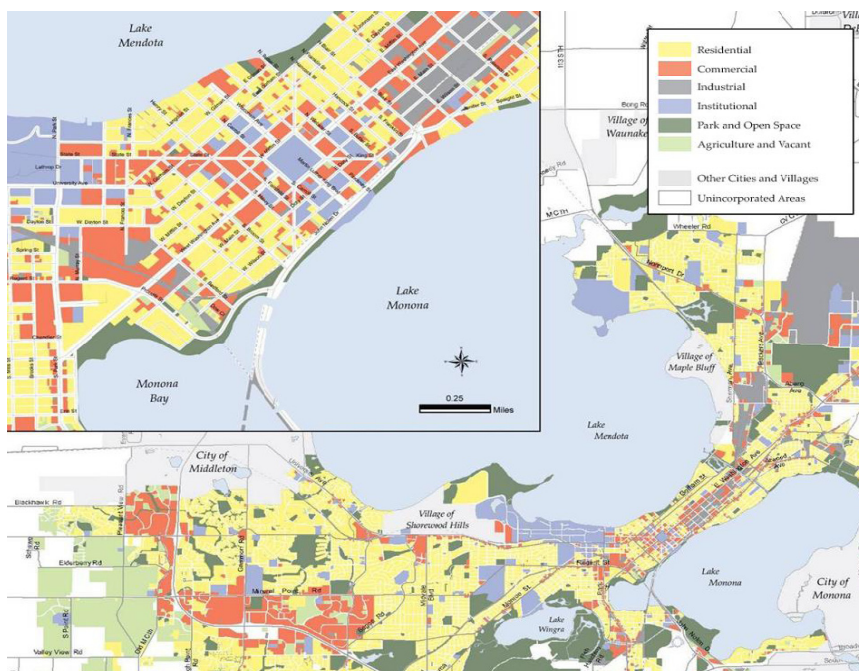
# Views and Vistas



# Transportation Grid



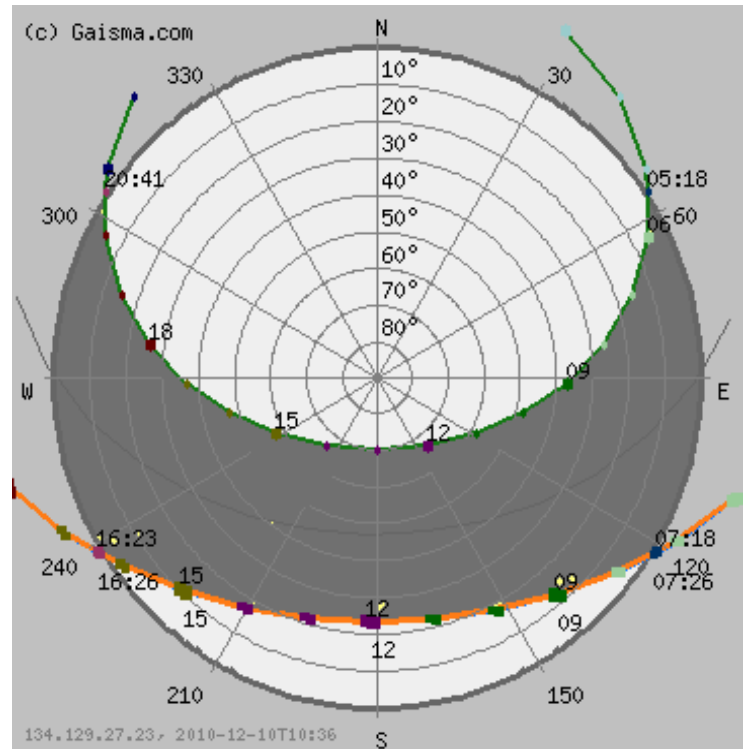
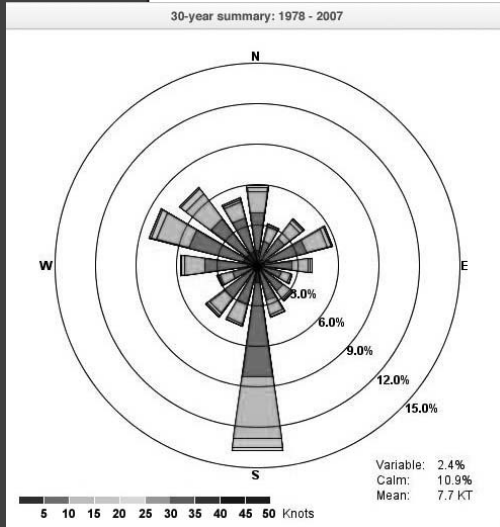
# Land Use



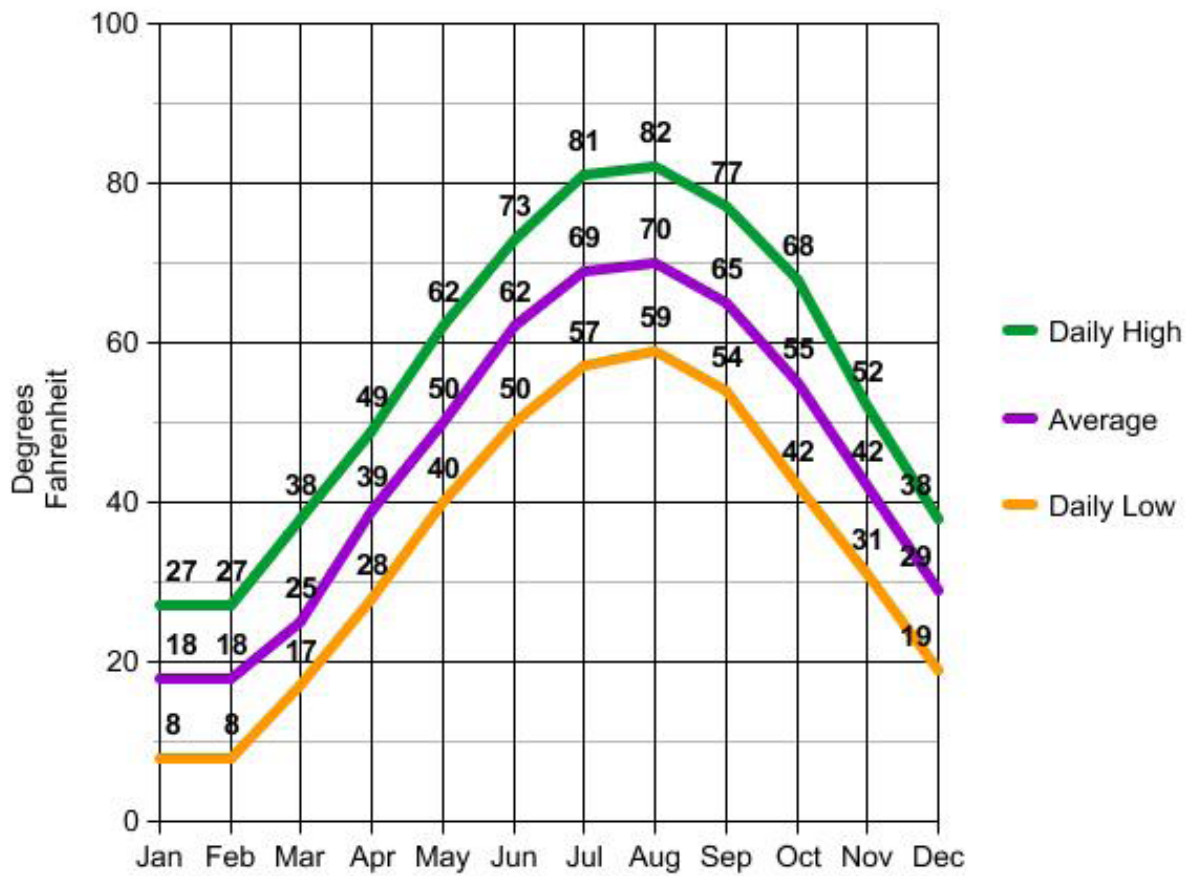
Images from (<http://www.cityofmadison.com/>)

# Climate Data

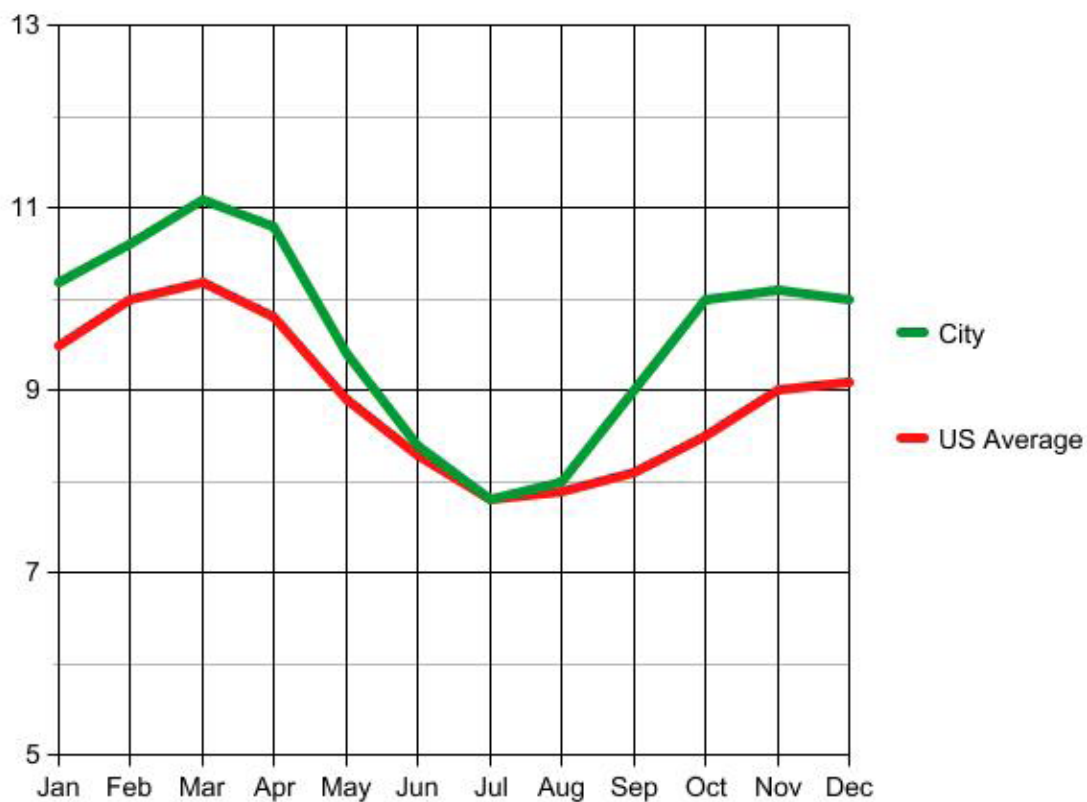
# Site Analysis



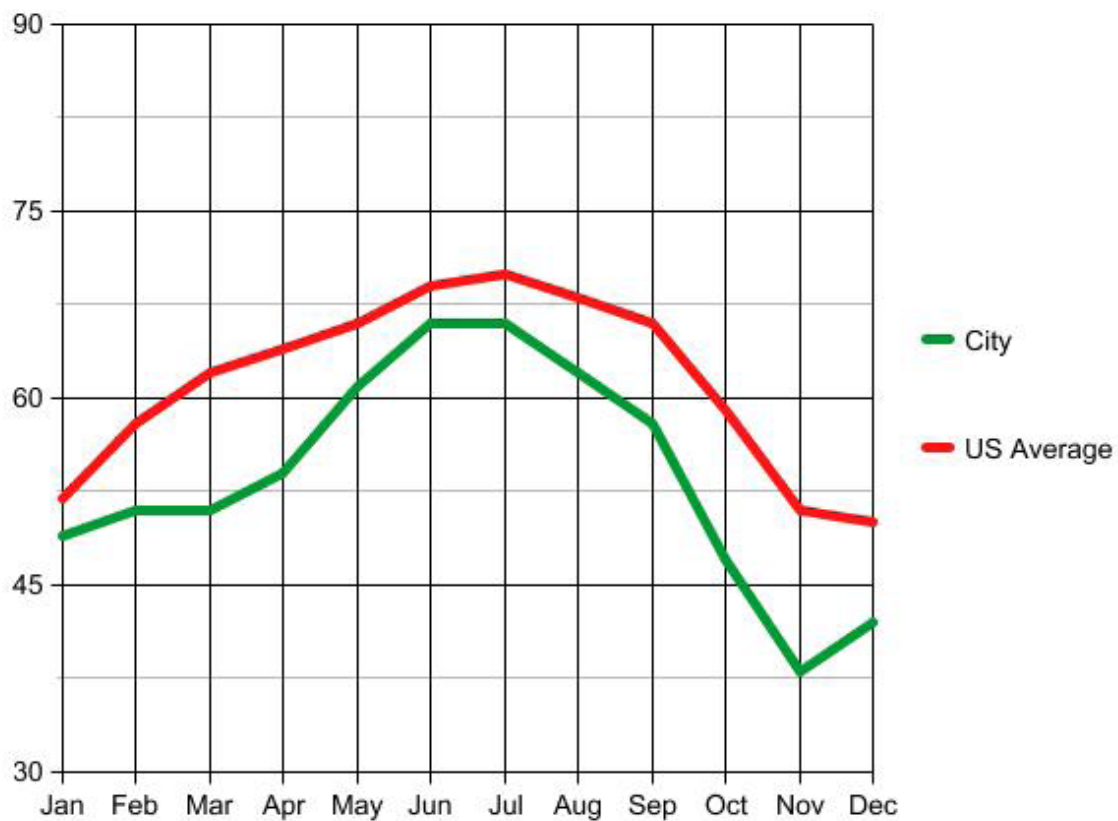
Average Temperatures



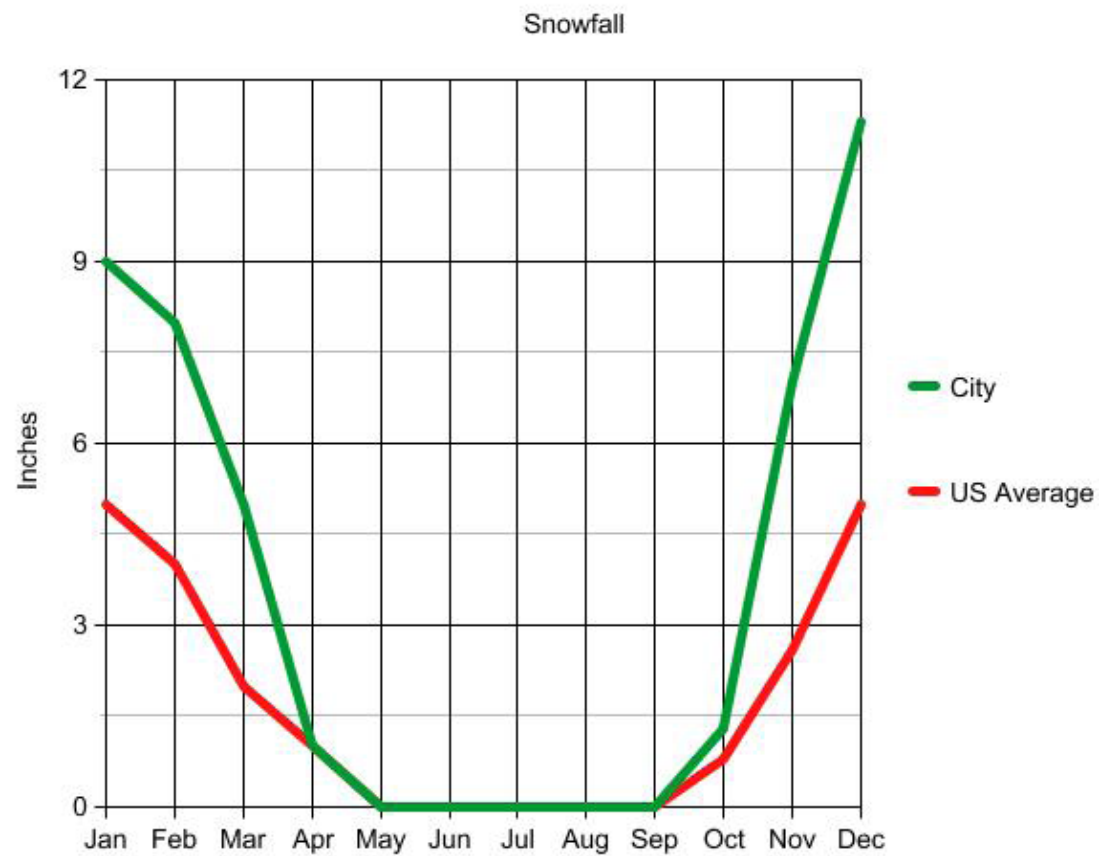
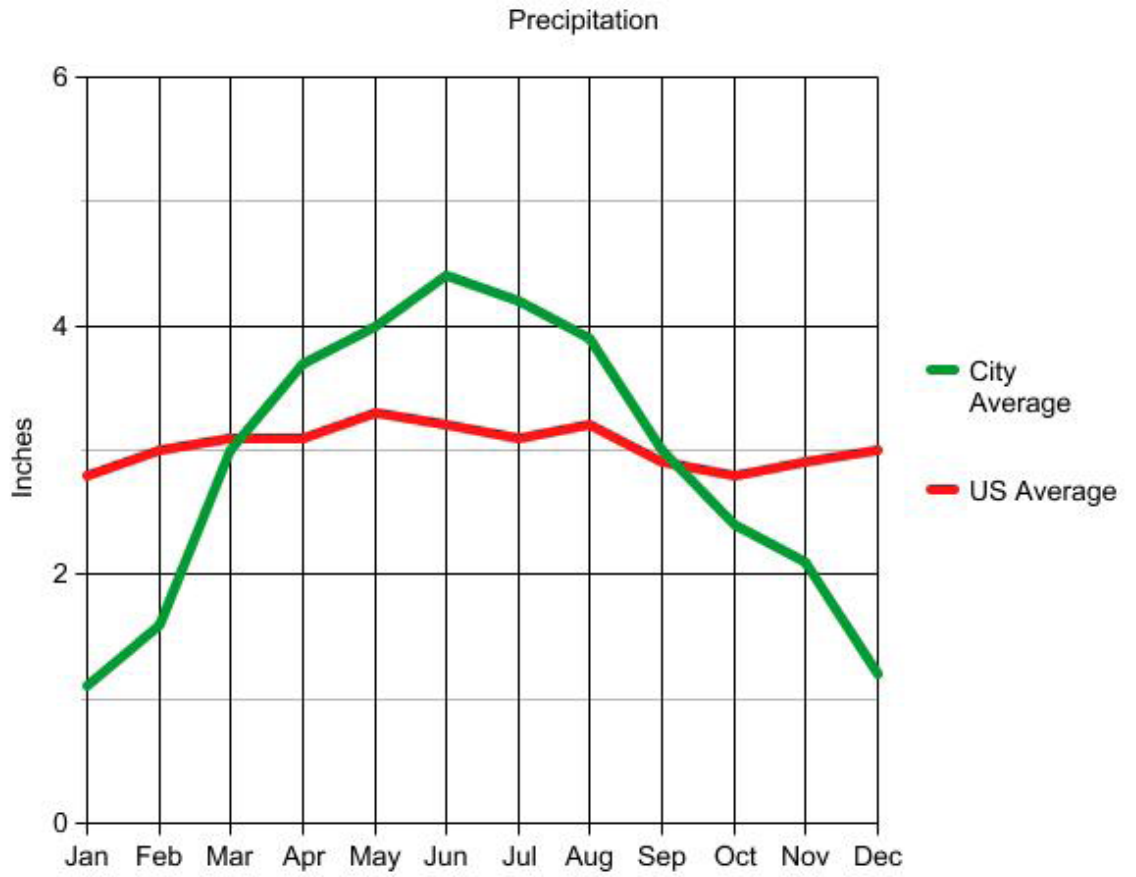
### Wind Speed (mph)

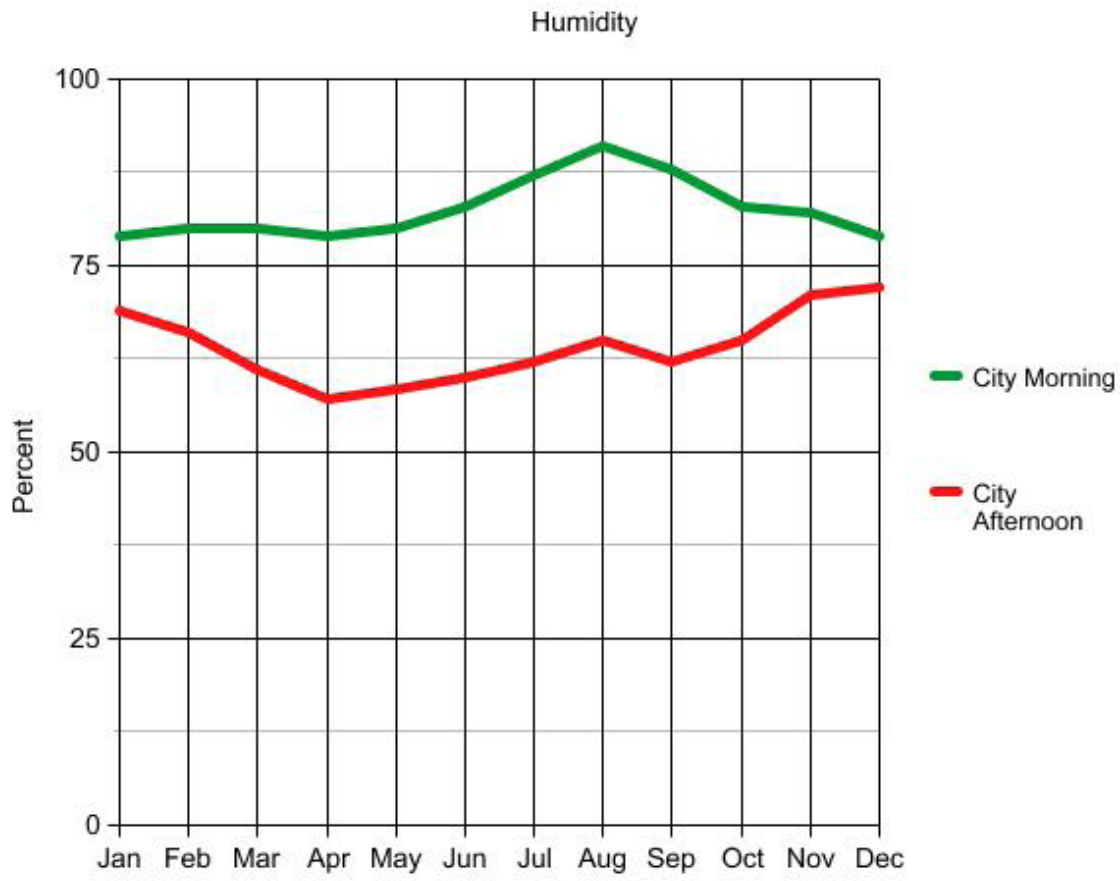


### Sunshine



# Site Analysis





# Site Analysis

# Programmatic Requirements

Ticket Lobby - - - - - 5,000 sf  
Concourse - - - - - 12,000 sf  
Loading Platforms - 33,000 sf  
Retail - - - - - 8,000 sf  
Circulation - - - - - 5,000 sf  
Booking Office - - - - 1,500 sf

## Program Additions

Lake Monona Park - 140,000 sf  
Sky Park System - - 270,000 sf



# Design Process





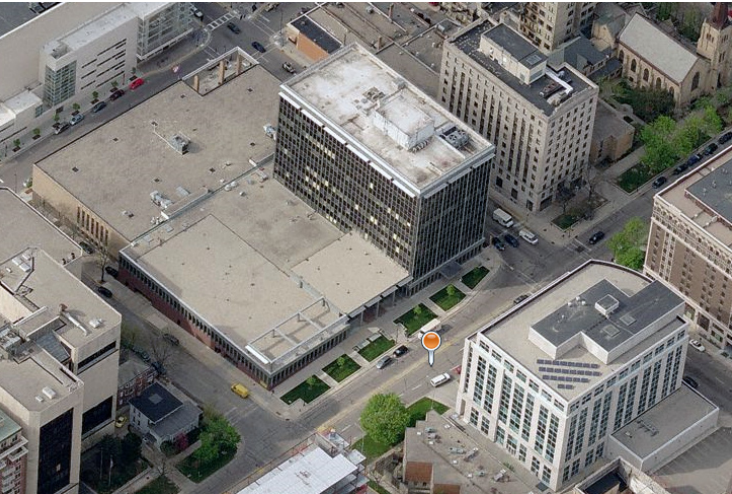
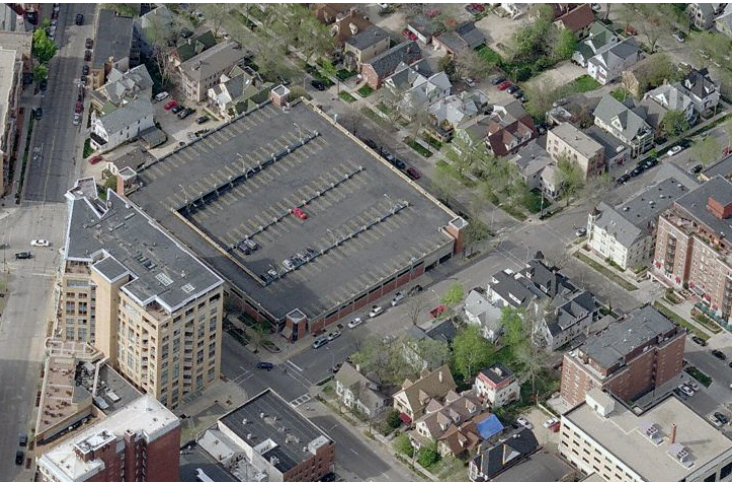
# Program Additions

Lake Monona Park - 140,000 sf  
Sky Park System - 270,000 sf





# Sky Parks



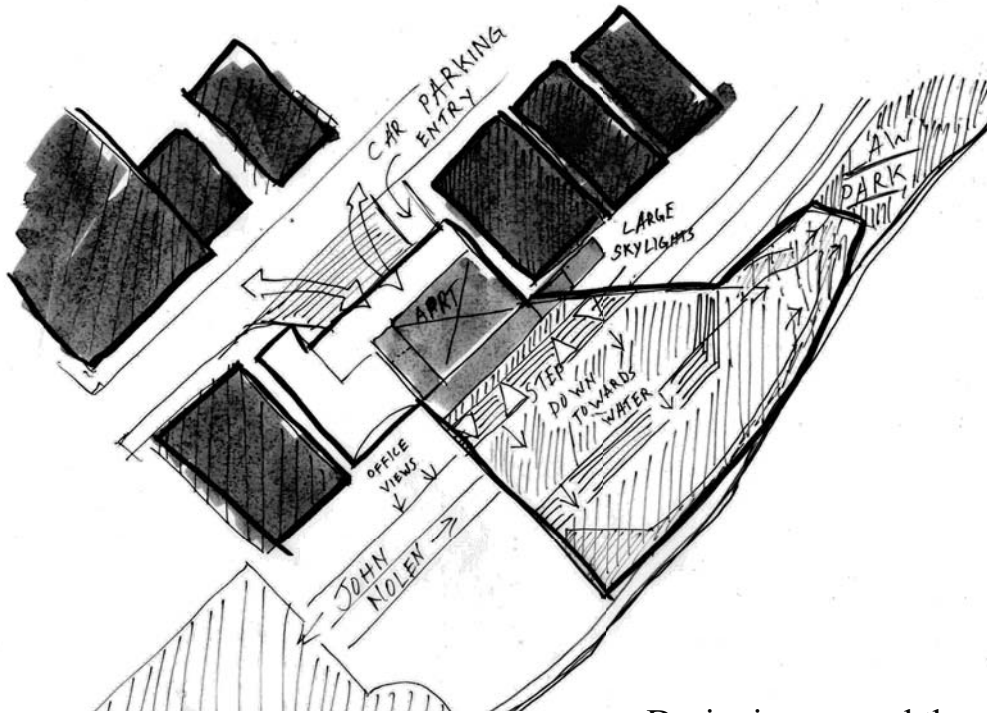


# Design Process

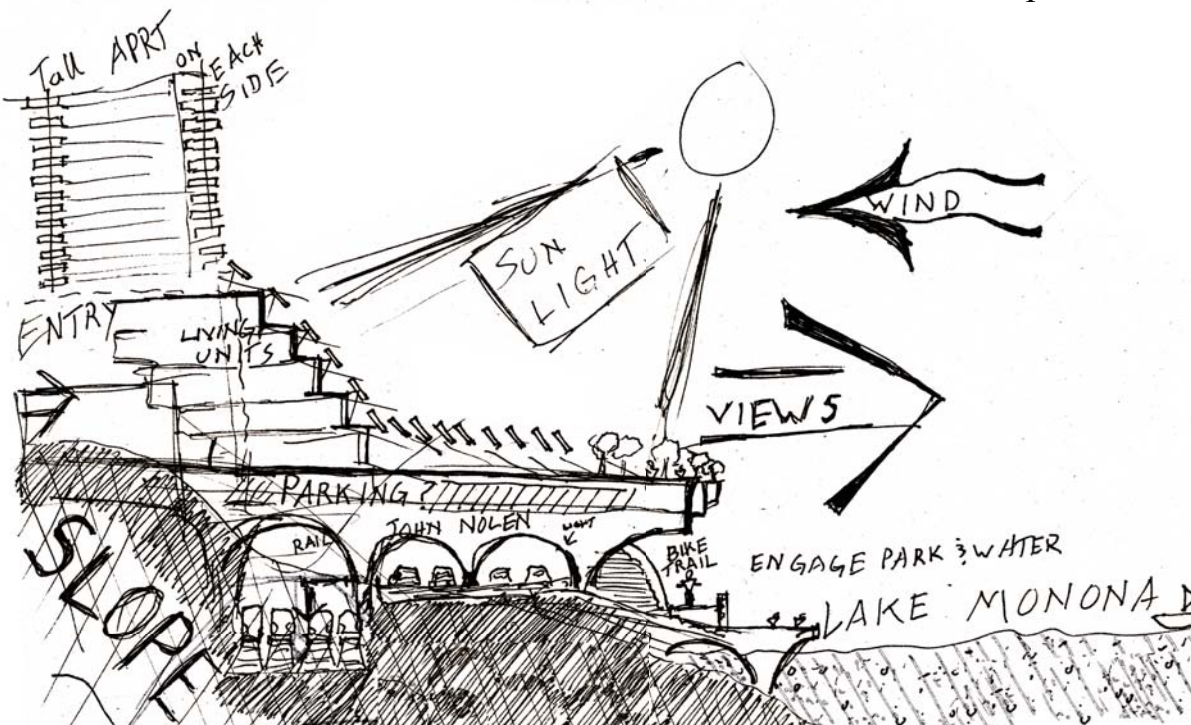
These sky parks will create a connection for the public between lake Monona and lake Mendota as well as create many clean air parks throughout the downtown area. These parks circulate around the capital and create a new way for bikers and pedestrians to experience the city.



# Design Process

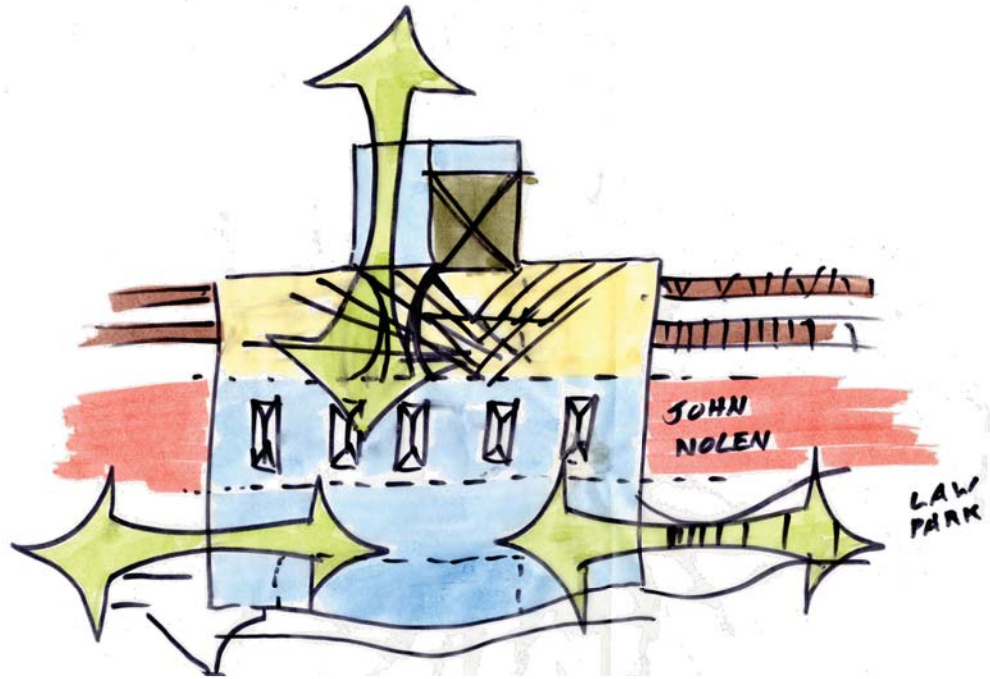
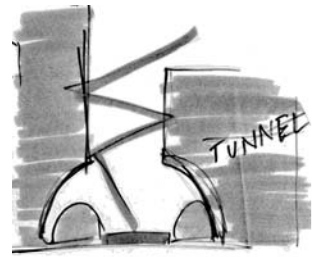


Designing around the site constraints, and developing main connection points

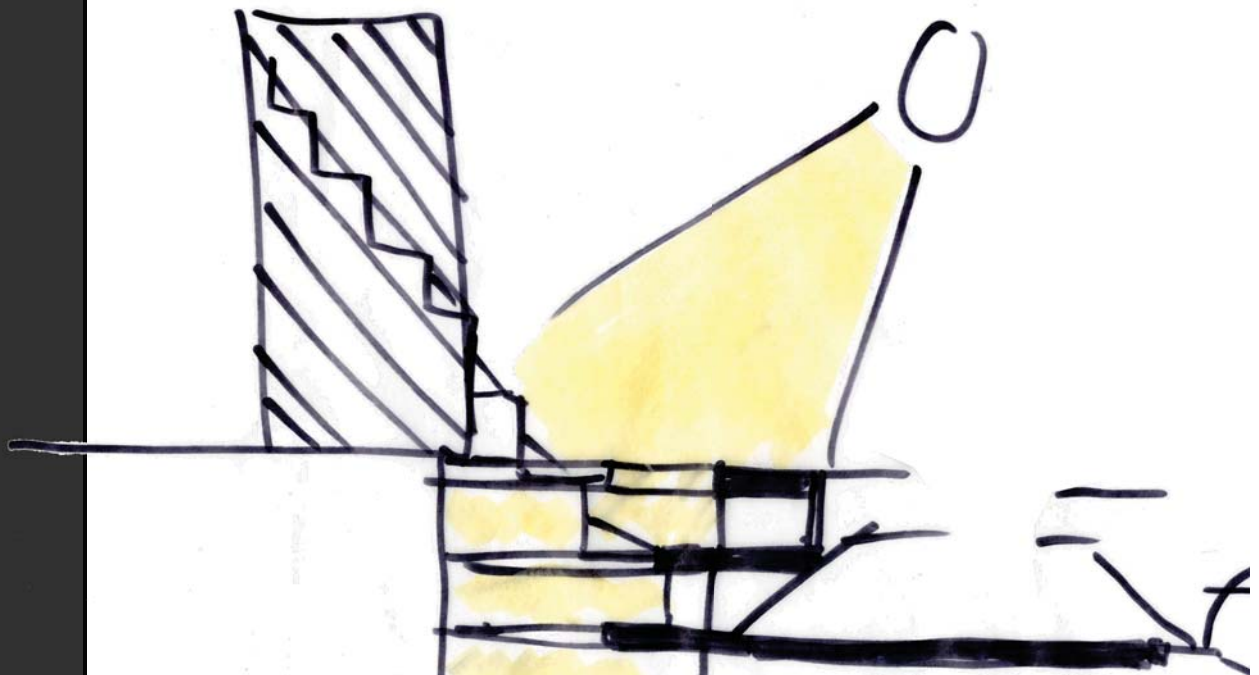


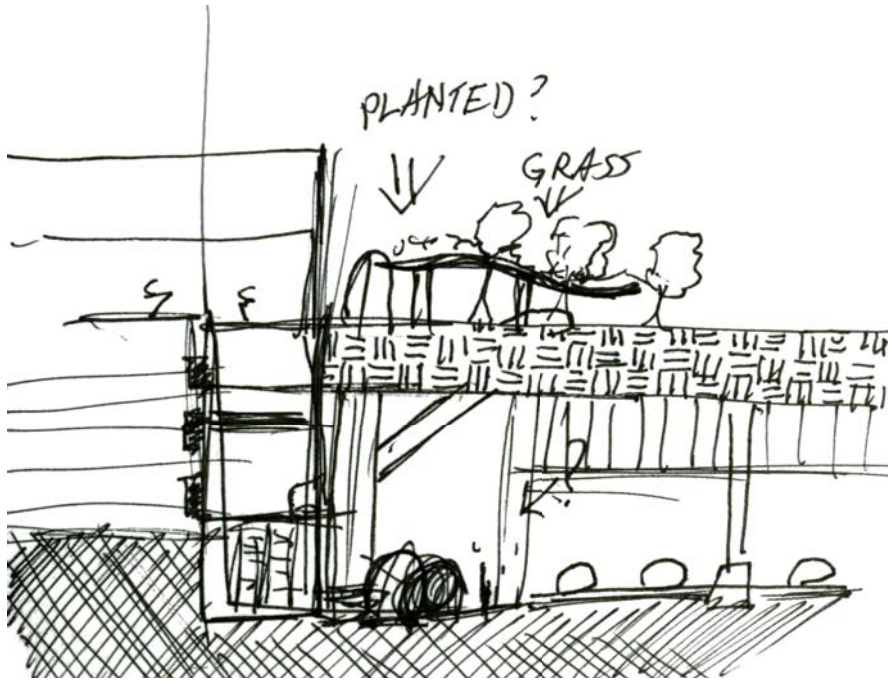


Creating connections for pedestrians to Law Park, as well as the bike path that runs along the shore of lake Monona.

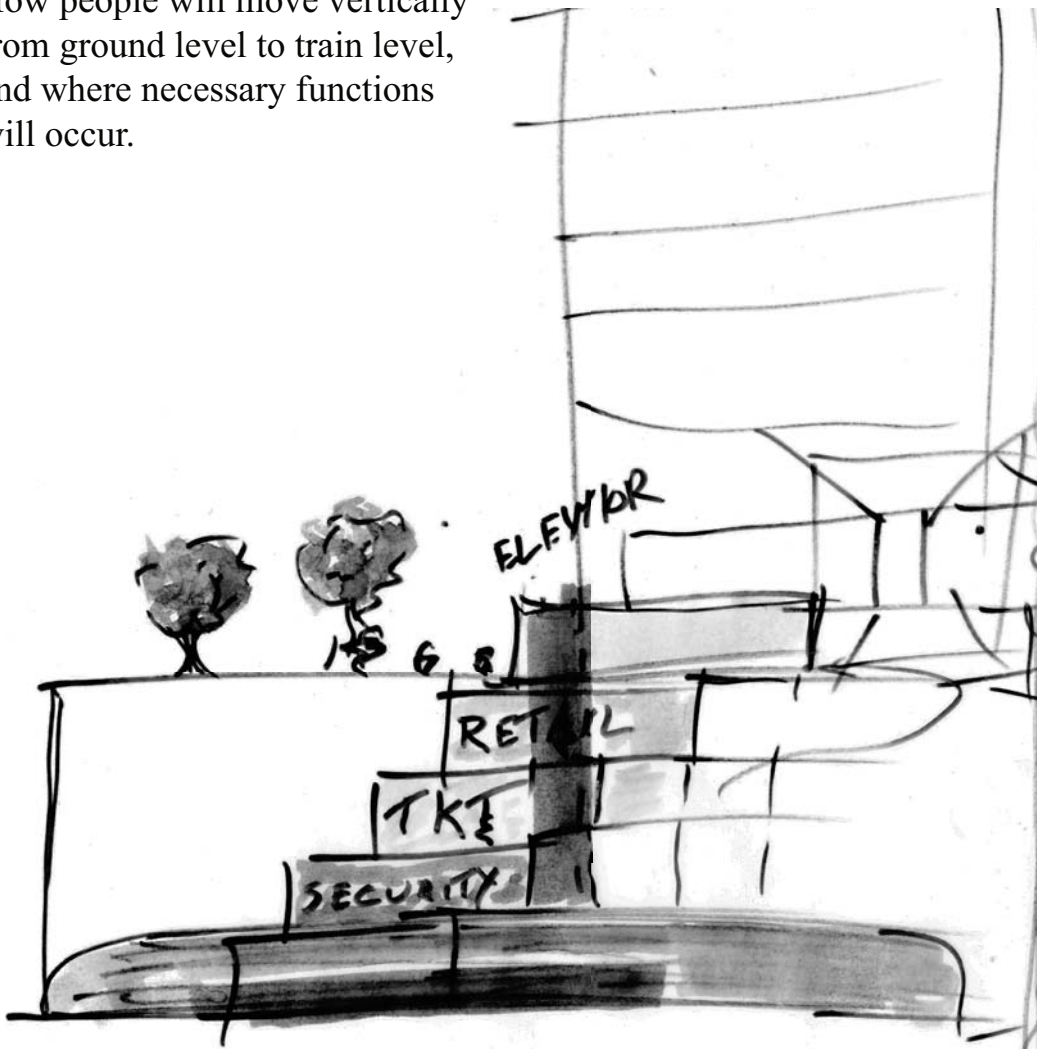


Trying to answer the question as to how natural light will be able to reach into the main train level.



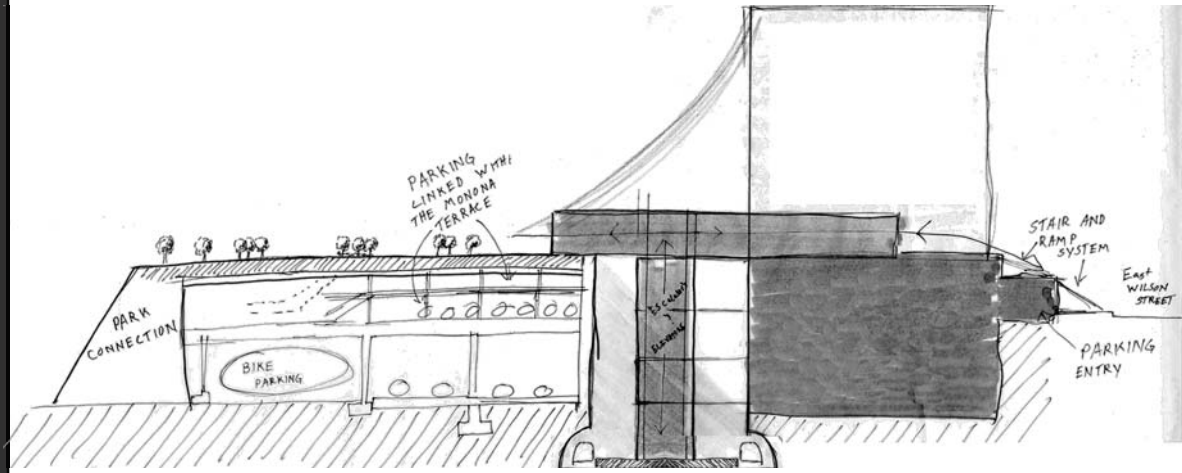


How people will move vertically from ground level to train level, and where necessary functions will occur.

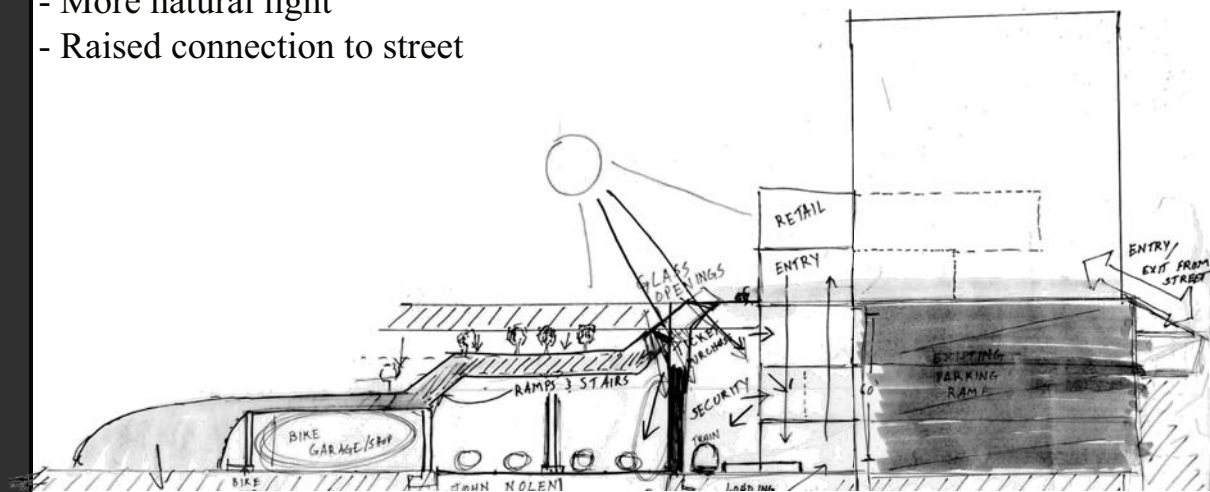


# Design Process

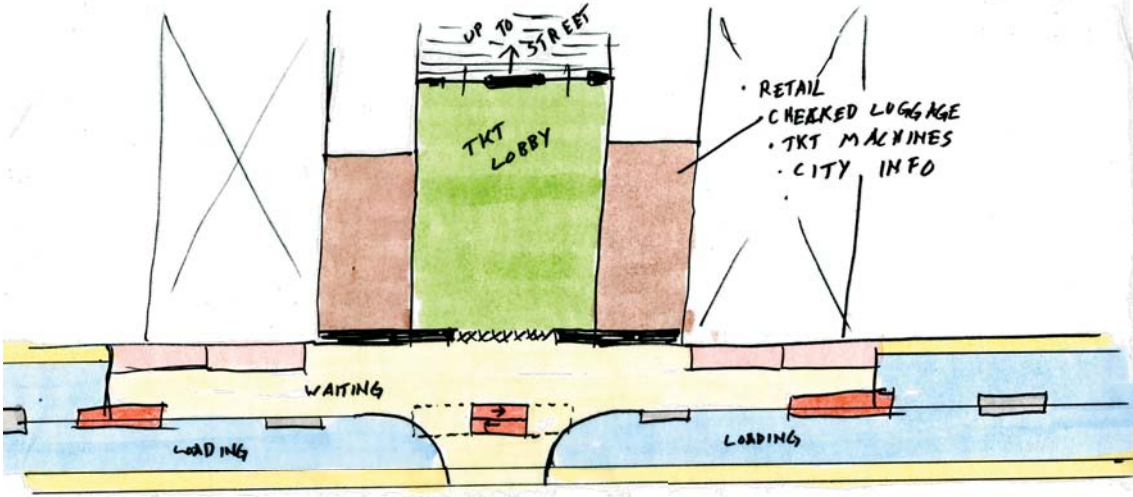
- More platform space
- **Difficult circulation**
- Less natural light
- Raised connection to street



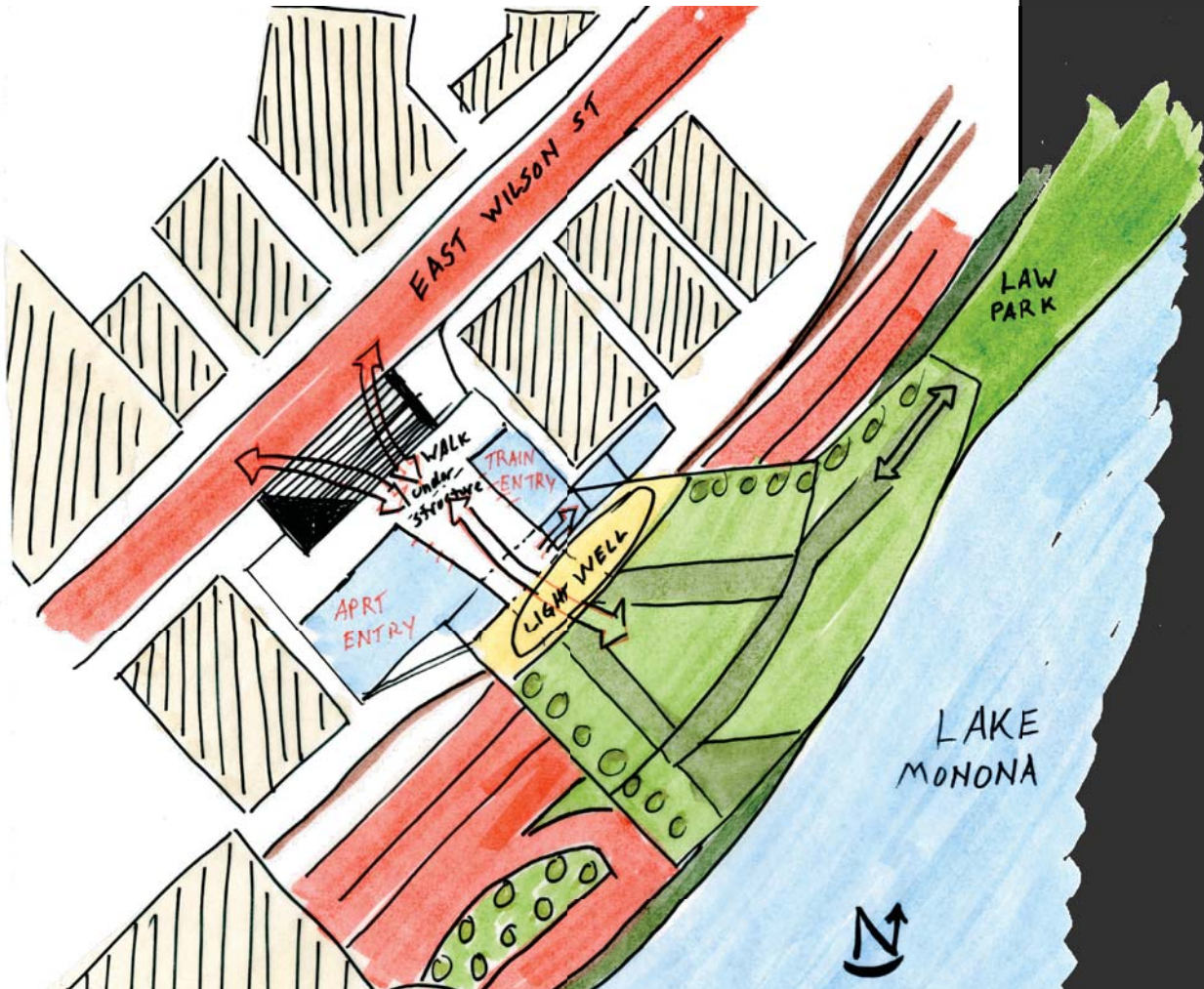
- Less platform space
- **Difficult circulation**
- More natural light
- Raised connection to street





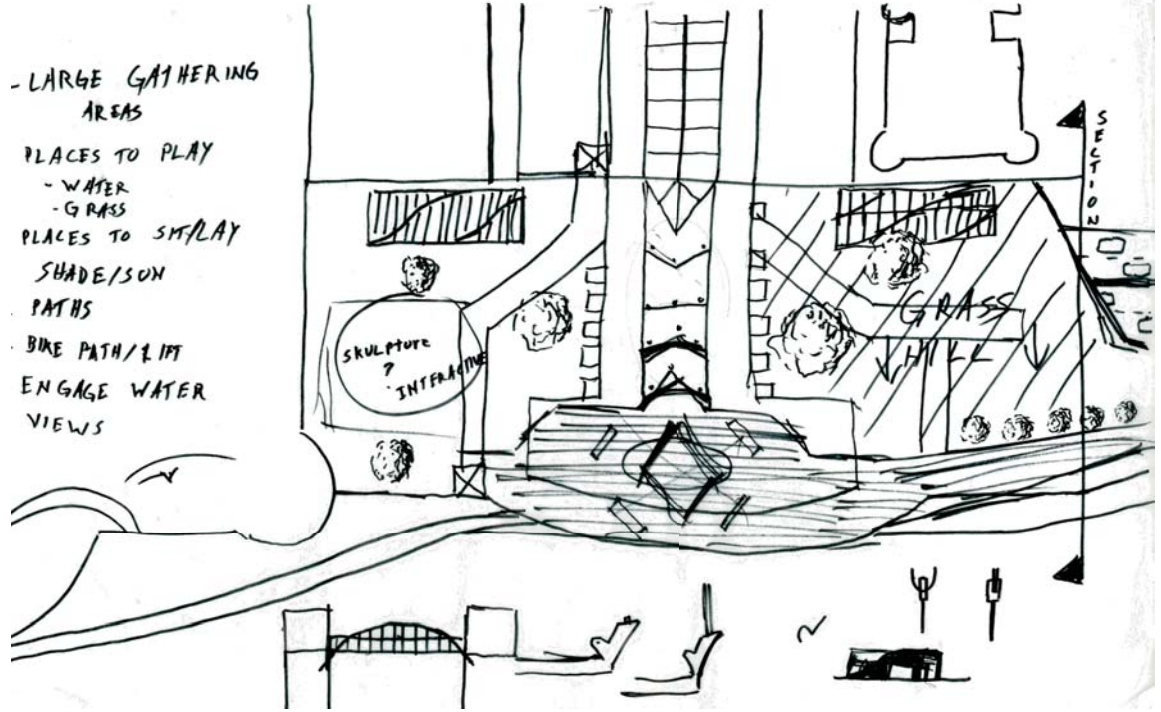


Further plan study

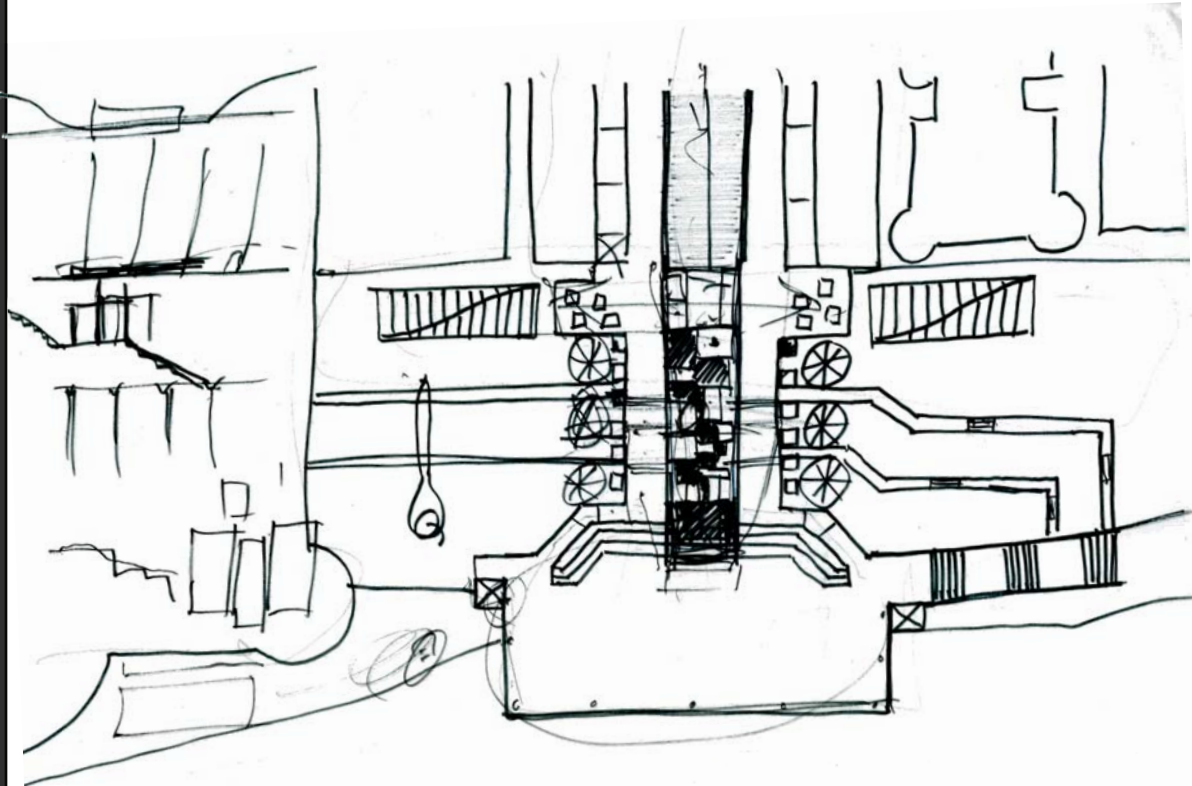


# Park Design

- LARGE GATHERING AREAS
- PLACES TO PLAY
  - WATER
  - GRASS
- PLACES TO SLEEP
- SHADE/SUN
- PATHS
- BIKE PATH/1.1M
- ENGAGE WATER
- VIEWS



- Central water feature
- Small retail shops
- places to enjoy both

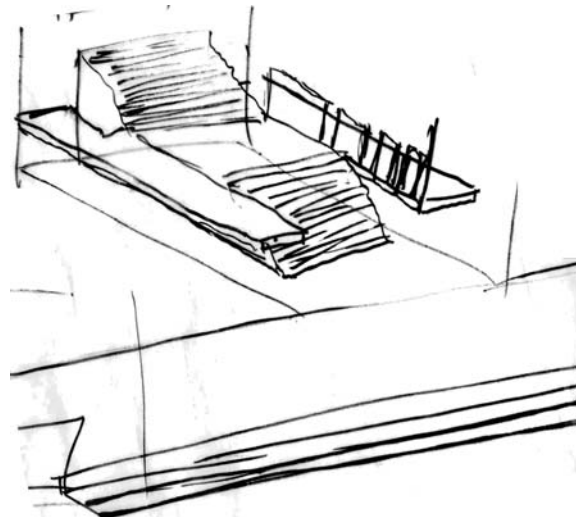




## Entry & Interior

Creating an enjoyable entry into the station by using a large naturally lit series of stairs that allows people to stop and enjoy the space

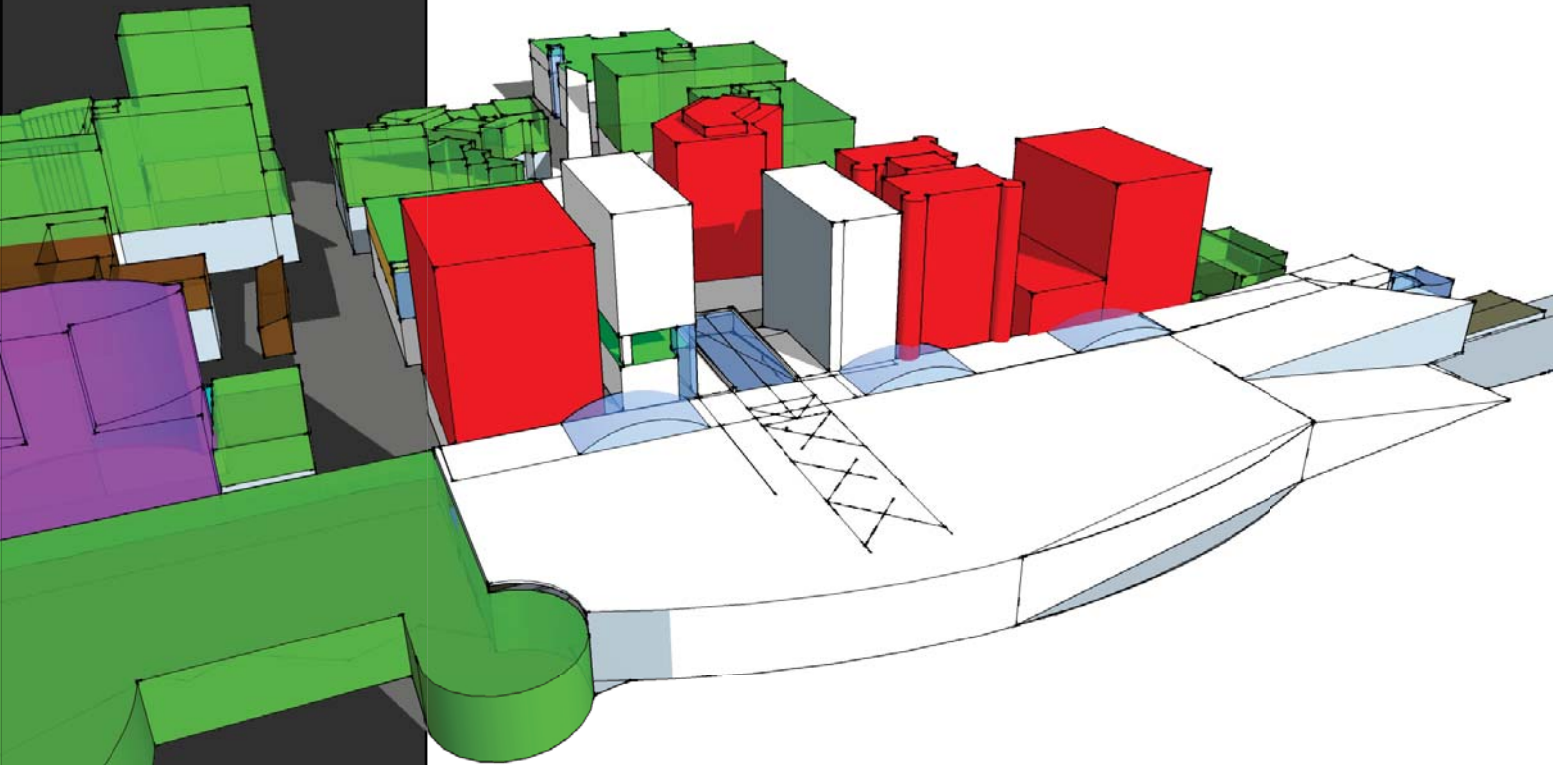
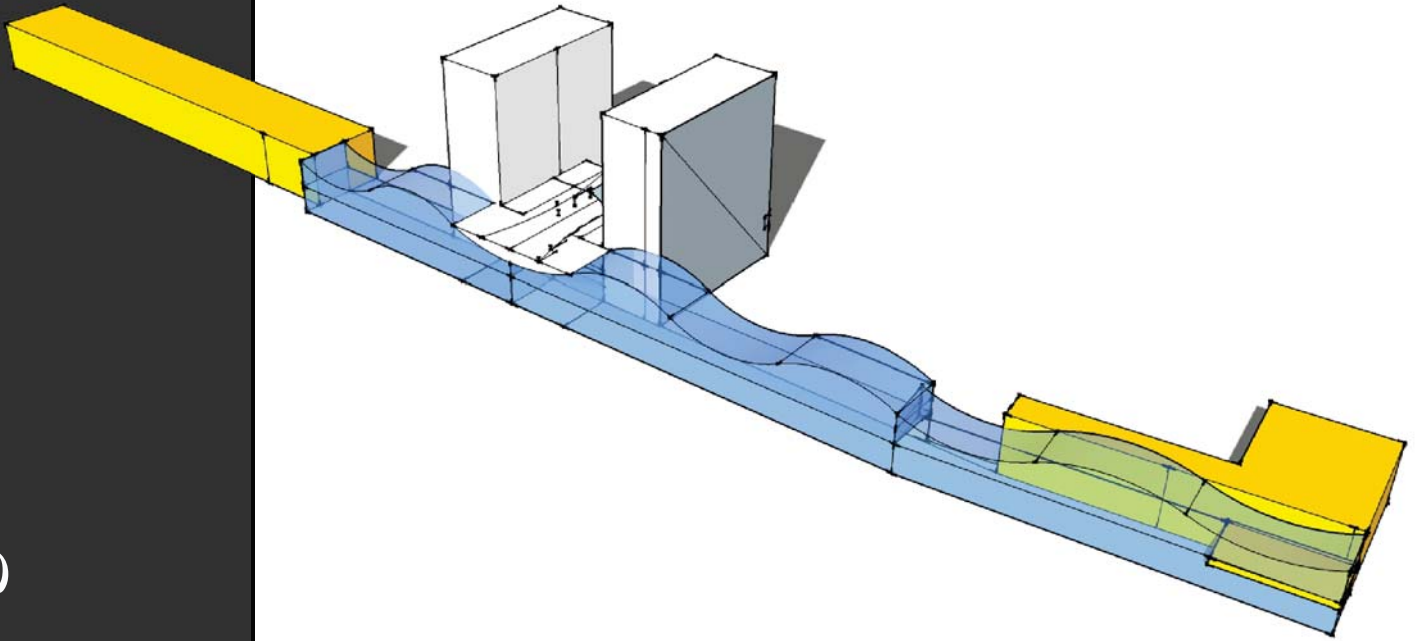
Simple plan layout creates a space that is easy to understand for the users of the station.



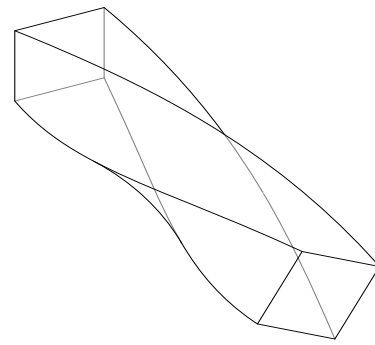
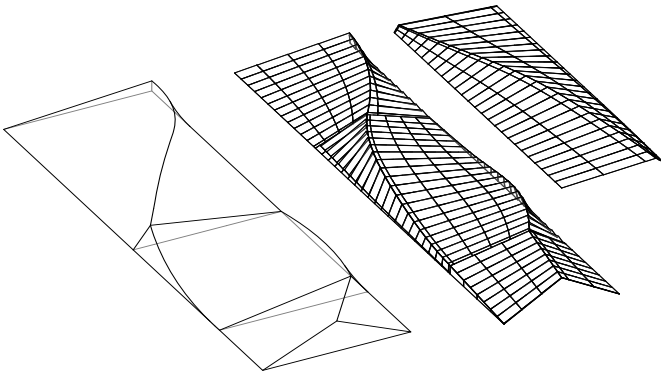
Spanish Stairs in Rome

Where did the form come from...

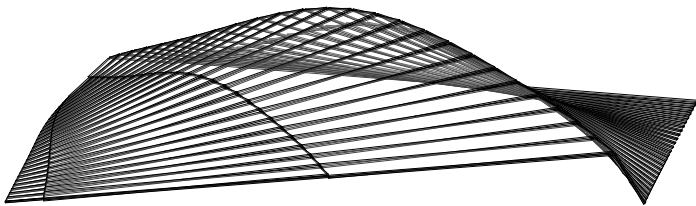
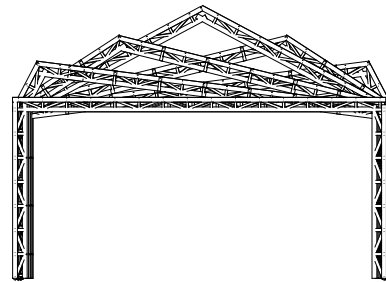
# Design Process



## Torquing

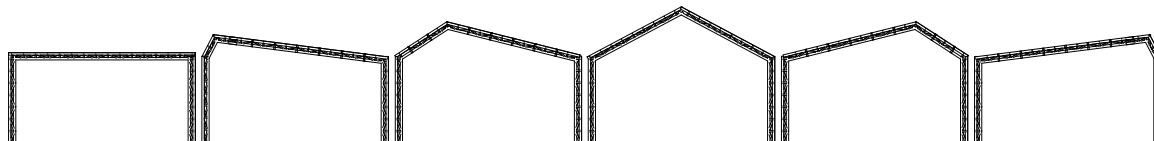


## Propulsion

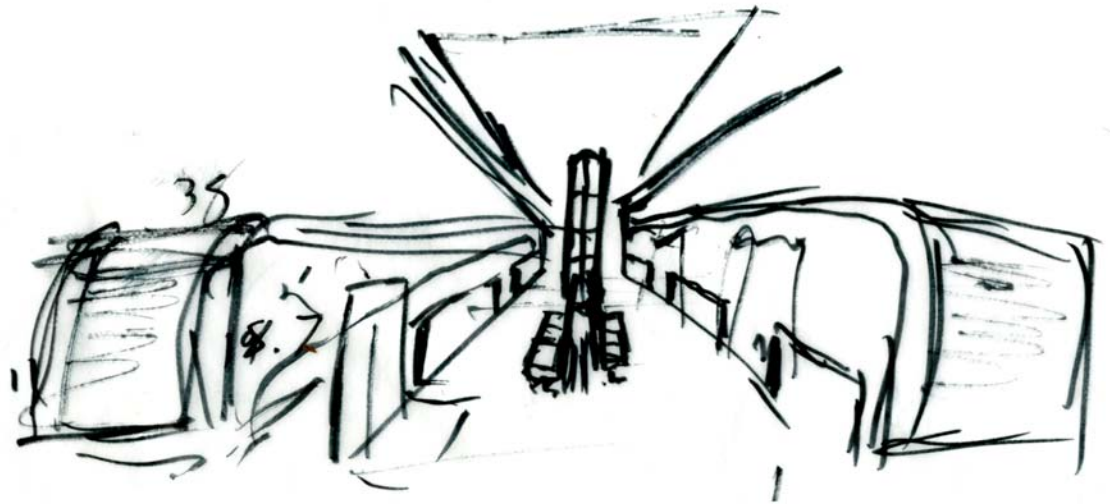


## Truss system

The torquing form will be created by a series of six different trusses that repeat themselves several times. This large skylight design will add to the spatial aesthetics of both the exterior park, as well as the interior station.



# Final Design

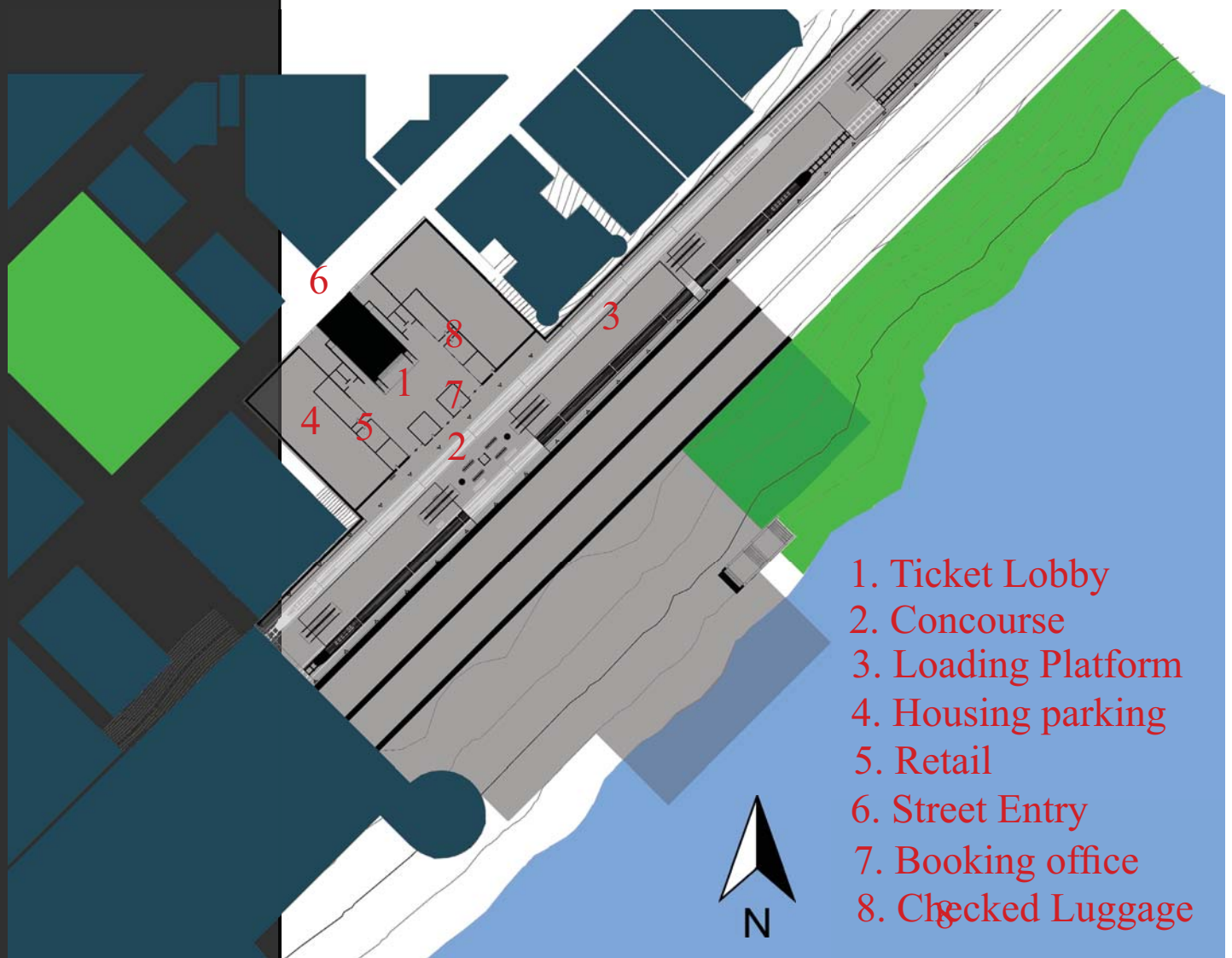




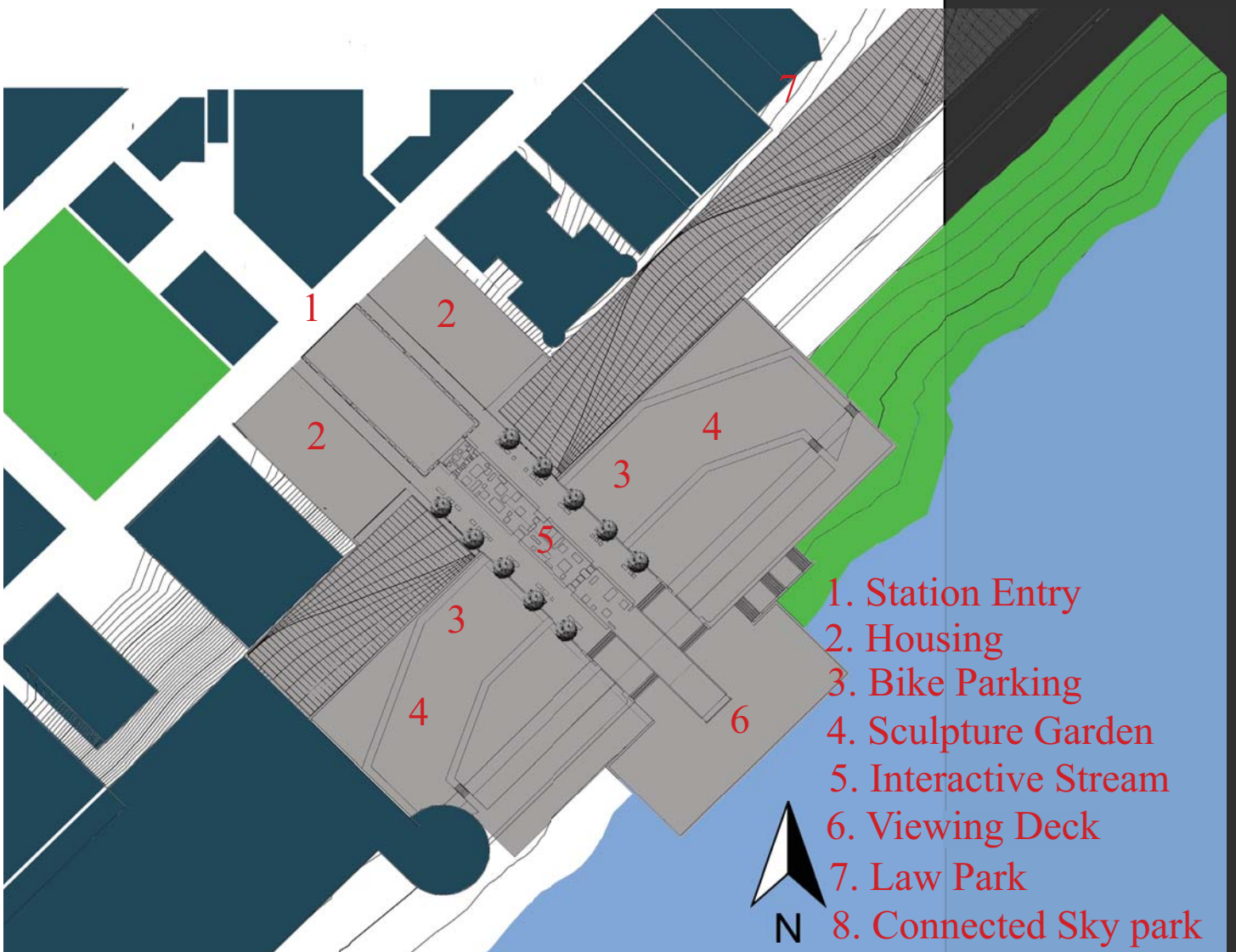


Drop off points

# Final Design









# Urban Paths

Creating Connections for People and Nature



The focus of this project was to create connections between cities, communities, and nature. Madison WI fit the description perfectly because of its great sense of community, as well as its location as a link for a new high speed rail system from Chicago to the Twin cities. The initial typology consisted of a high speed rail station for the city of Madison, however the site chosen offered itself many opportunities to give back to the public. The project then evolved to include a 140,000 sf park that bridges over John Dr, as well as a system of Sky Parks connecting the two lakes.

This system of parks will be formed on various buildings throughout downtown with flat roofs that would be suitable for a Sky Park. These parks will be accessible from the High Speed Rail Station, as well as from any of the Sky Park locations through bike lifts. This will create a truly unique way for people to experience the city of Madison.



This view of the station entry shows a green wall that accompanies you while walking down to the train level. The entry also serves as a gateway to the park as it brings the water out to the street, and allows for a playful interaction throughout the park.

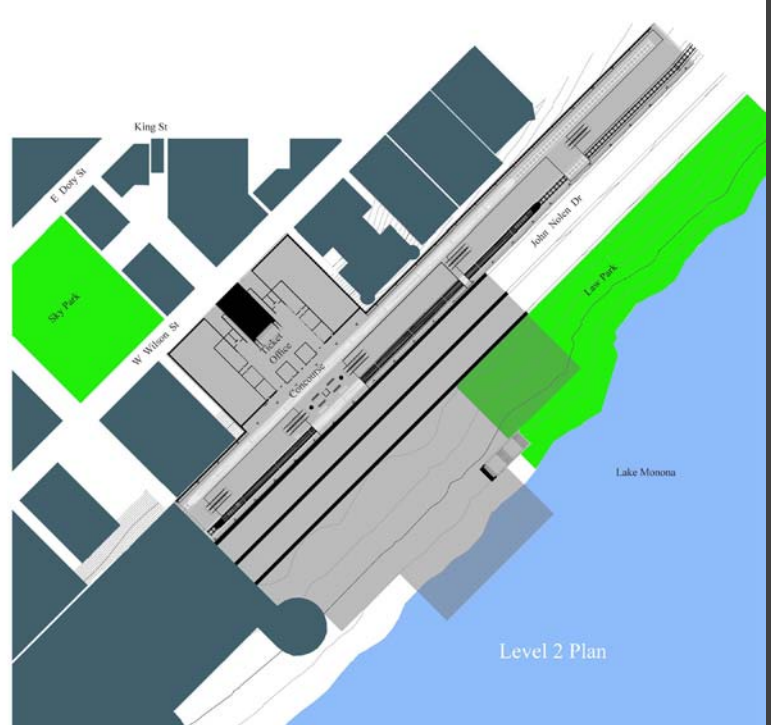
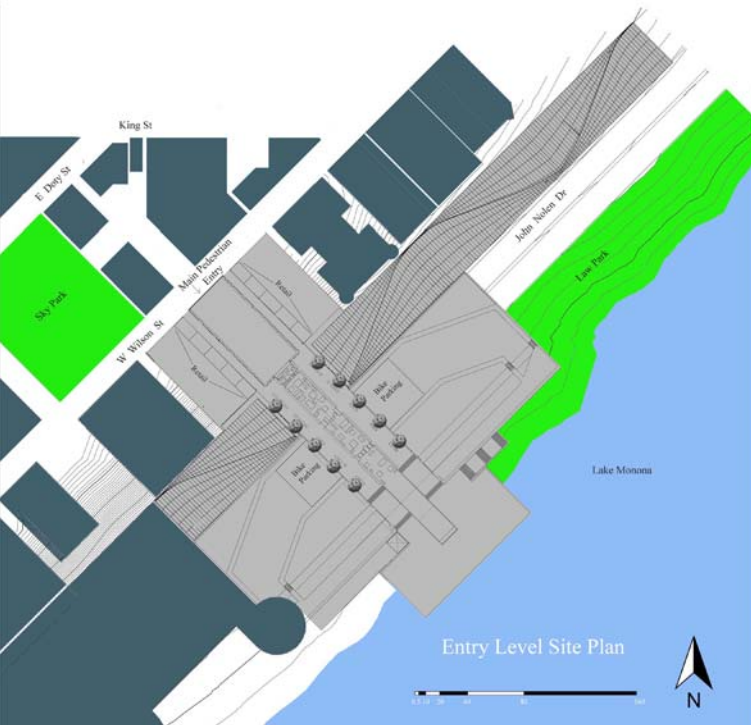
## MADISON STATION

Time	Destination	Expected	Current Time
1 st	Chicago	08 54	08 24 11
2 nd	St. Paul	09 07	





The site is located in the strip of buildings that line John Nolen Dr., and the bridged park extends out to the shore of Lake Monona. The site map to the left shows the main entry/exit points to the train station. The center ring will serve as the main pedestrian entry, while the outer two are drop off points for taxis and busses.



A view of the central water feature through the park looking towards lake Monona







Thesis by Aaron Grunwald  
Instructor Darryl Booker  
Software, Revit, Photoshop

# Personal Identification



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**Favorite Quote:**

“It is very important to understand why  
it is very important to understand this.”

Dunnet, N., Kingsbury, N. *Planting Green Roofs and Living Walls*. Portland, OR: Timber Press, Inc.

Haggard, B., Reed, B. and Mang, P. 2006. "Regenerative Development: New approach to reversing ecological degradation offers opportunity for developers and Builders." *Revitalization Magazine*, January 2006. <<http://www.integrativedesign.net/resources>>

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