CHANGING AND ADAPTING

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ABSTRACT

Sustainable architecture is growing in popularity and necessity all around the world. More and more people and governments are recognizing the need for sustainability to improve the health of the planet and the people that call it home. The problem is usually these projects are disconnected and just focus on one element, being green. This thesis focuses on how net-zero architecture, connections to nature and all-around interconnectivity can improve the health, wellbeing, and happiness of an entire community. Through a major mixed-use development on the bank of the St. Croix River, and exploration of how different architectural elements can have differing impacts on people, we can improve everybody's wellbeing and thus build our communities for the long term in an ever growing and changing world.

NARRATIVE

Sustainable architecture has become the standard in recent years in an effort to protect our environment. Along with this design methodology shift, energy production is becoming greener and cleaner, moving away from coal and other polluting and economically unstable energy sources. Left behind from these changes are decaying power plants and contaminated sites in otherwise beautiful locations. Coincidingly, cities and developers are tearing up greenfields, farms, and natural habitats to mass-produce single-family housing. Redevelopment of tattered industrial zones and brownfields provides a much more sustainable model to grow communities, retain open space and practice environmental reclamation.

Addressing these practices, the redevelopment of a closing coal power plant along the banks of the St. Croix National Scenic Riverway to create a sustainable, healthy, and holistic community integrated with nature, serves as the design response for this thesis project. Integrating living communities with natural landscapes provides numerous health and happiness benefits as well. Restoring the disturbed and polluted landscape and repurposing the smokestack become the drivers for the project in creating a community designed for human interaction with nature.

TYPOLOGY

This project will be a mixed-use community masterplan based around a coal power plant redevelopment and site reclamation. There will also be a landscape design element as a riverfront development with the connection to the river being an emphasis.

Salvaging and repurposing the coal plant structures becomes a key element as well. Keeping existing structures is much more sustainable in terms of cost, carbon footprint, environmental impacts of the footprint, and infrastructure.

Figure 3

MAJOR PROJECT ELEMENTS

This project will consist of multiple net-zero, mixed use buildings with a focus on all-inclusive living. The current coal power plant on the site will be repurposed to help fulfill all the desired program elements as well as serve as a clean, renewable energy source. Around the rest of the site will be designed and natural green spaces and built connections to the water.

Sustainable transportation elements will be included to help with the health and carbon reduction emphasis. These will include city bus routes, connecting to Stillwater, Minneapolis and all cities in between, bike share, and a proposal to a new light rail line to expand the current metro transit system.

As the project is located on the St. Croix River, flood prevention measures will be taken and designed to ensure safety while maintaining the human connection to the river.

USER/CLIENT DESCRIPTION

The clients for this project would be a combination of developers, the cities of Stillwater, Oak Park Heights, and Bayport, and owners of the commercial spaces of the development. The cities would assist with the development as it will benefit their citizens positively in multiple ways. Developers would help absorb costs as well as find users and draw them in. As a mixed-use development there will be commercial/retail spaces and the initial business owners would have more options for their spaces.

The users of the development would be residents of the living community as well as anybody else because of the multiple uses of the project. A goal of the project is to bring in everybody and anybody to experience the entire project and the river connection, to hopefully improve their wellbeing as well. The project is centered around the users and their health so understanding them and how they will interact with the site, no matter their age or type of person, will be incredibly important.

SITE INFORMATION

The site chosen for this project is the current site of Xcel Energy Allen S. King Power Plant at 1103 King Plant Road, Bayport, Minnesota. Located just south of historic downtown Stillwater and along the banks of the St. Croix River, this site was chosen as a way of displaying and amplifying our commitment to cleaner living. The power plant is a coal powered plant that will be shut down by 2028. This site is optimal to help the new age of energy, sustainability and growth be seen from all around the world.

Stillwater is the largest city along the St. Croix River. Considered the birthplace of Minnesota, the city is known for its use of and connection to the river. People flock to the area to absorb and experience the beauty and opportunities the city and natural environment has to offer. While it has always been a landmark as a city, the smoke stack of the current power plant acts as a wayfinder that can be seen for miles and pairs nicely with the two major bridges that give Stillwater its identity. Moving forward, the smoke stack can still be a wayfinder but also can transform into a symbol of progression and sustainability.

The selected site is the perfect option for this project as it is one of the last sites along the river in the city that is or will be available. With plenty of vegetation and wildlife, it makes for the perfect place to reconnect with nature. Being located near the historic Stillwater, this new community can strengthen the bonds in the area by still connecting to the surrounding neighborhoods through the increase of trails and nature connections.

SITE INFORMATION

Figure 4

PROJECT EMPHASIS

The primary emphasis is a masterplan that unifies the community through architecture and connections. Simply having sustainable architecture or being close with nature will not have the result of positive impacts on people's health that this project is aspiring to. Connecting all the people and all the aspects of the project together to create unity is a major factor for achieving a major improvement in health, wellbeing and happiness. Health and wellness does not stop at simply physical health, mental health is just as important and can be addressed by all the same design techniques to ensure that every person is supported.

Another emphasis of the project is the site location and the premise behind it. The site is currently a coal plant that is set to close by 2028. Being a net-zero, sustainable development, this site is used to show the change in our energy and building ways to improve our environment; bringing new life to our struggling environments.

GOALS

Connection to Nature

"Undesigned" natural spaces should be provided for all users. Interactive riverwalk and beach areas with easily accessible connections to the community should be included. Show how design can educate people about nature and its benefits. Integrating nature into the building design to help blur the lines between built and natural.

Figure 5

History and Symbolism

As a major piece of history and culture for the community, retaining the most important and known elements becomes important to help grow and move forward. Emphasize and show symbolism in the change of society and its priorities and desires. Continue moving forward with design, while also being influenced from the past.

Figure 6

GOALS

Community

To help promote and grow community, spaces should be designed for interaction. Giving back to the community by including spaces for all to enjoy and interact with others. Create all types of housing necessary to help the community grow.

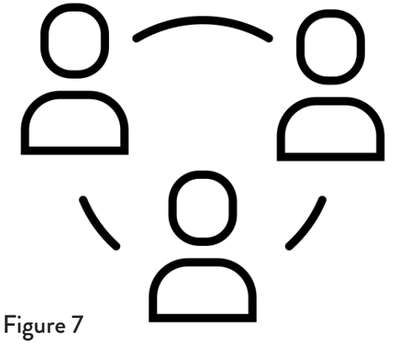

Figure 7

Sustainability

Design for flexibility and long term. Sustainability goes much further than energy efficiency. Being able to withstand all weather and economic forces makes a community sustainable. Including renewable energy sources helps the community stay resilient for the future.

PLAN FOR PROCEEDING

Design Methodology

How can net-zero or sustainable architecture, connected to the users through nature, be used to improve the heath, wellness, and happiness of said users?

To answer the primary thesis question, precedent studies will be the primary method used to study how implementation of net-zero building strategies have effected the users. Interviews will be considered for site research to interact with those that use the site, live nearby, or see or interact with the site frequently. Quantitative and qualitative data derived from healthcare professionals on how different building and design strategies effect health will also be studied.

Documenting the Design Process

The design process with be documented through a continuously changing variety of methods:

Design Process:
- Digital Models
- Diagrams
- Hand Sketches
- Digital Analysis

Programs for Design:
- Autodesk Revit
- Rhino 7
- Lumion
- Adobe Photoshop
- Adobe Illustrator
- Adobe InDesign

PLAN FOR PROCEEDING

Schedule

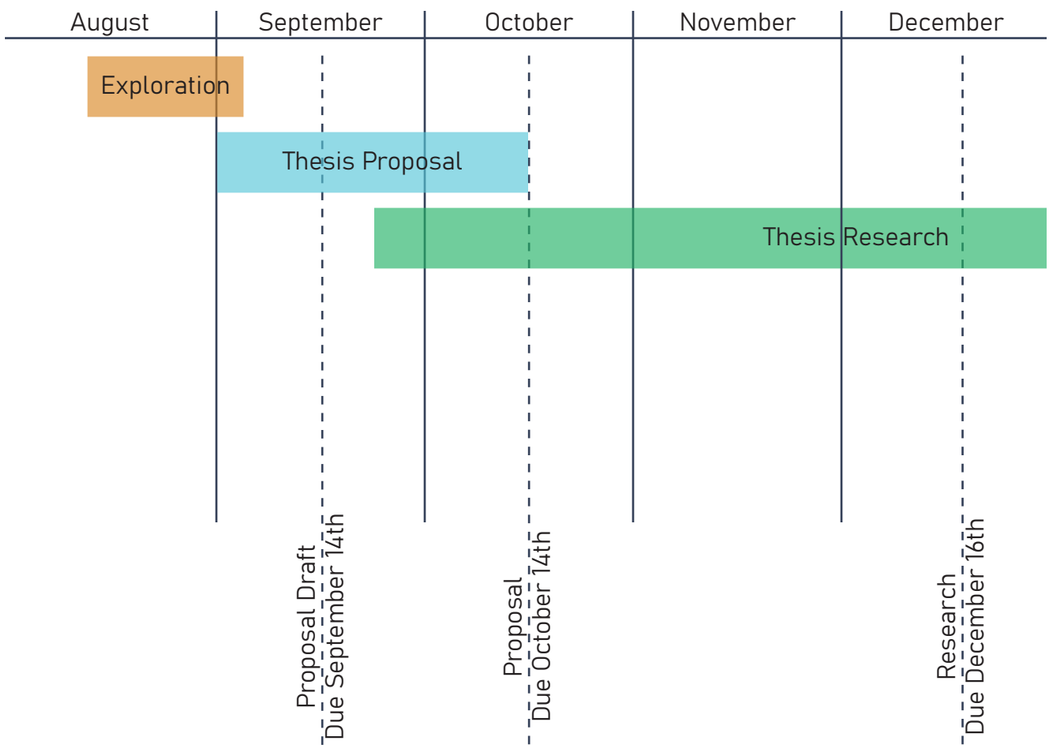

Table 1

PLAN FOR PROCEEDING

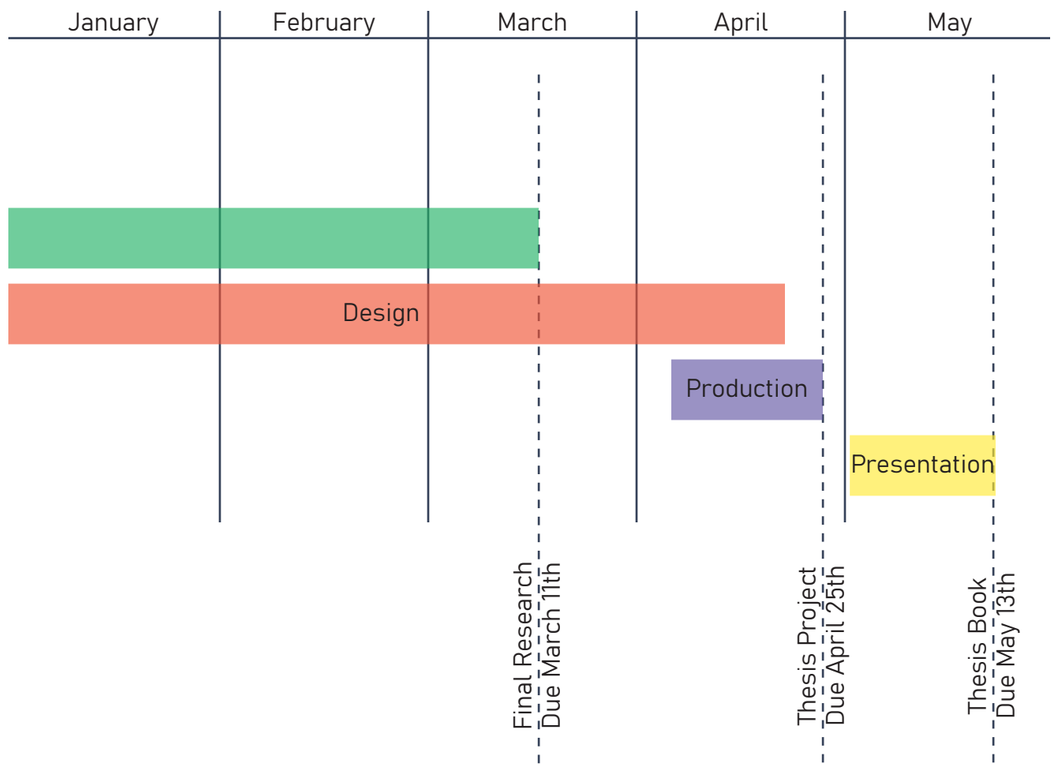

Figure 8

“The fate of retired power plants can also determine the future of neighborhoods.”

- Gregory C. Staple and Matthew I. Slavin

THESIS RESEARCH

Introduction

To ensure a completed thesis project and strong base for the design, multiple research methods were utilized and are collected in this section. Each of these methods were chosen with an element of the project in mind with the purpose of assisting on the design of that element.

Journal articles were collected and reviewed first. The articles covered the topics of adaptive reuse of coal power plants, benefits of interacting with nature, and walkability. Case studies were conducted of three architectural projects relating to adaptive reuse and master planning. Site research was conducted through site visits and online research of varying conditions to set the basis for the design and possibilities. The historical, social, and cultural context of the site and project elements was defined and explain to further discover the philosophical premise of the topics. Based on the case studies, a basis is set and defined for evaluating the final design and the criteria is identified. Finally, the project is justified multiple ways to provide why the project is important and what will be discovered from it.

All of this research was collected to help define the need for this project and provide framework for the design of the project. Each element of research simply scratches the surface for the primary topic so that the final design will explain each topic more in-depth and connect the differences together.

Repurposed Coal Plant Sites Empower and Revive Communities

Gregory C. Staple and Matthew I. Slavin

The first text in this literature review, *Repurposed Coal Plant Sites Empower and Revive Communities*, serves as an introduction to what should be done with old, retiring coal plants and why these strategies should be used. Gregory Staple is the CEO of American Clean Skies Foundation and Matthew Slavin founded Sustaingrup; both authors have high ranking positions in the sustainability world. Discussed in the article is why architects and developers should prioritize utilizing retired coal plants as the driving force behind new communities whenever possible. Staple and Slavin argue that when we repurpose coal plants, we are investing in and revitalizing the communities they exist in. Throughout the introduction, the authors discuss how important it is to plan ahead with these projects, as opposed to a majority of these types of projects where the existing coal plant had been sitting vacant for years before a team stepped in to repurpose and redevelop it. Planning ahead would allow for less economic impact because of property taxes of high amounts not being received by the local community, causing the local government to raise taxes for residents or cut essential programs.

Staple and Slavin go on to explain how these projects should reflect the community it is in, through goals and pride. Many communities still take pride in these buildings even as heavy polluters. There becomes an architectural dilemma of what buildings have significant architectural, historical, or cultural value to a community to the point of which coal power plants should be kept and repurposed and which should be demolished and replaced. Building from that concept, if the replacing typology is not a museum, what elements can be kept as an education moment of our history. Half of the premise behind adaptive reuse projects is the education of its past and should be considered.

A major problem with these projects, as discussed in the article, is the funding for the environmental clean up and construction of new spaces. Staple and Slavin explain that many coal plants still emit high amounts of dangerous pollutants into the air and that millions of Americans still live in areas that are below standards

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for air quality. Cleaning up from a coal plant requires potentially years of intense work and tests. There are public funding options that can help alleviate some or all of the costs of clean up, redevelopment, or long term fees. EPA Revolving Loan Fund (RLF) program is the first solution given and gives grants to different government levels for brownfield site assessment, clean-up, and capitalization Although, these grants are not available for nonprofit organizations and the grant recipients still have to cover a percentage of the costs. Economic Development Administration (EDA) provides funding to different levels of government as well as the nonprofit partners. EDA grants will typically cover up to 50% of the costs of projects for economically distressed communities and that address national strategic priorities such as innovation and environmentally sustainable development. In addition to the clean-up funding options, there are also tax incentives for energy efficiency and low income housing.

To summarize the article, the authors reiterate that these old coal power plants are part of their local communities and their history and have played a significant role in the economy. Community goals should be put first when determining a repurpose and redevelopment project so that the benefits are substantially higher. These projects should also be planned so the burden on the community is lessened and the benefits of new jobs, housing, commercial space, or public space is available sooner.

This article was selected for research because the topic directly relates to this thesis project of repurposing a coal power plant. Major takeaways from this that will be used towards successful completion of this project are put the community history, culture, and goals first. Being sure the project will have the highest benefit to the community and encompass what they are and want to be will provide the greatest level of success possible. Finding a creative solution to the clean-up process also becomes important because the community this project is based in does not have the economic base to completely fund the project and higher taxes on the residents would be met with substantial push back as the area is made up of primarily middle class residents. Overall, this article provides a strong basis for what should be considered and emphasized with a project of this typology and magnitude.

The Psychological Impacts of Interacting with Nature-Based Design

Mahgol Seirafian Badoldashti, Seyedeh Marzieh Tabaeian

The Psychological Impacts of Interacting with Nature-Based Design is a research study and report completed by Mahgol Seirafian Baboldashti and Seyedeh Marzieh Tabaeian comparing the psychological impacts of individuals between two different experiences.

The report begins with the introduction into why nature is important to man. It is stated that since the beginning of the human race, there has always been the attempt to create a human connection between the spaces they reside in and nature. Urban architecture over the course of the past decades has done the opposite. Rather than finding and building that connection to nature, people have become disconnected because of the development of metropolitan cities and the lack of consideration to natural environments' benefit for human health. As physical and mental health conditions continue to rise at an alarming rate, studies have recently been conducted to find any correlations. These studies have come to find that green spaces help to reduce stress and improve mental health in city residents. Although proven less effective, this can be simplified to even only having pictures of natural landscapes inside a space, showing that any interaction is better than none. People who spend at least five hours a month physically or visually interacting with have more and stronger positive emotions than those who do not. This report continues on to explain this topic of environmental impact on health can be reduced to simply color. Red attracts attention and increases motivation but is also a sign of hostility (aggression, anger, or anxiety). While green has a relaxing effect and attracts less attention.

Some believe that since humans are inherently a piece of nature, we must interact with or have a relationship with it to become "perfect". Humans' relationship with nature has always been existent and can never be truly perfect anymore because of how we exclude ourselves from nature into structures. Perfect can be better explained in this context as, being cohesively integrated together with minimal disruption. Badoldashti and Tabaeian express the intention of this study and

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report is to bring attention to the importance of designing for interactions with nature and find and explain the correlations between those interactions and the psychological impacts and health benefits these designed spaces can have. The absence of nature in cities brings angry, fear, and worry upon people and leave them acting and feeling negatively.

Urban green spaces inherently bring positive impacts to the people that interact with them, not just physical but mental and emotional health as well. Research done in this report compares differences in health impacts of nature filled spaces and non-nature spaces. Some examples of what was found was natural landscapes reduces anxiety, anger, and fear while urban landscapes increased anguish. Patients in a hospital who regularly saw trees and natural landscapes recovered faster, received more positive notes, and required less medication while those who only saw their brick wall room had the exact opposite effects. Another study showed those who interacted with natural environments had improved moods and lower blood pressure while blood pressure increased in those who did not interact with nature. The conclusions we can draw from this is that if people are easily able to interact with natural environments regularly, we will see an increase in health and moods, reduced treatment times and cost, and lowered crime rates.

Other research explained in this study listed the different types of impacts human interaction with nature had. First, the difference between accidental and intentional interaction were explained with accidental being while walking or driving to work or plants inside a building. Intentional interaction is described as recreational activities and horticulture or agriculture. It was found that these spaces had mental health, cognitive function, and physiological health benefits. Mental health benefits were improved mood and self-confidence, reduced anxiety and anger, and overall mental health increases. Cognitive benefits are improved performance and productivity and reduced mental fatigue. Physiological benefits are reduced headaches, lowered blood pressure, and life expectancy increases (with reduction of circulatory diseases). Overall, interacting with natural environments allows humans to feel calm and focus and think more clearly. It is also found that human health is not only based on genetics, but also a collection

of numerous conditions of life. Global ecosystem including the different environments, activities, communities, and lifestyles is the first influence on human health. Biodiversity and climate stability of environmental components like trees, air quality, and pollution levels also become important factors of human health. These are all explained as crucial to the health of people and societies.

A human interaction study was completed with this report that examined numerous psychological effects on people in two different environments/ scenarios in Isfahan, Iran. The first environment was the control of the study, Bozorgmehr Street. This is a built environment of a city center. The second environment was Mellat Park, a park adjacent to the largest river in the region with trees, grasses, flowerbeds and hosts numerous recreational amenities and live music performances. The study had research participants going through one of the two environments (sitting, walking, interacting) and filling our questionnaires based on how they were feeling and what they were thinking throughout their time in the environment. Results of the study reflected and confirmed the hypothesis of the researchers that interacting with natural environments has positive impacts on people. Looking at some of the specifics measured, inner vitality increased over time in the park and decreased in the city. Another scale, Positive and Negative Affect Scale, showed that people experience more positive affects simply after seeing the green space and less negative feeling in the park compared to the city. The study also found people to be more creative in the park and felt better after sitting in the park and wanted to stay longer. Overall, the study concluded that designed green spaces and interaction with nature have a positive impact on human health, spirit, mental health, and improves performance of the urban area.

This research study and report was chosen for inclusion in this thesis because human interaction with nature is a point of emphasis. What was learned from this report is that any interaction with any nature will have improve physical, mental, and emotional health of the people that do interact with it and creates a more productive and happy community. This report sets the basis for a major component of this project and provides direction for how the human interaction of nature can be designed to improve health and wellness of the users.

LITERATURE REVIEW

What is a Walkable Place? The Walkability Debate in Urban Design
Ann Forsyth

Walkability, as defined by *What is a Walkable Place? The Walkability Debate in Urban Design* by Ann Forsyth, is inherently undefined. This journal article discusses the issue with the words “walkable” and “walkability” and how they do not have specific definitions as each organization or company defines them differently. Forsyth breaks the idea down to nine different definitions in three different clusters to help us understand the words better. The first cluster is considered themes related to community environment. This includes “traversable” relating to ease, “compact” relates to distance, “safe” as in perceived and actual safety in numerous varieties, and “physically enticing” or intriguing, which are the *means* for creating walkability. The second cluster is perceived *outcomes* of walking/walkability and include, “lively and sociable” in the sense of what a walkable environment would be, “sustainable transportation” as a way of getting from location to location, and “*exercise-inducing*” which is when someone walks for the purpose of exercising. The final cluster is for when walkability is used as a “*proxy for better design*.” This includes, “multidimensional” which means there are multiple variables and factors that are measurable, and “holistic solution” as in simply being better. All of these terms are grouped together by Forsyth and are shown to actually pair together. Different environments and scenarios can encompass one or multiple of these definitions depending on the conditions.

As the terms “walkable” and “walkability” are defined differently by each person, there are numerous theories into walking. Many of these actually describe personal characteristics, individual behaviors, and social contexts as being more influential than physical environment, which is only incidental. This suggests that designs are simply not enough to create “walkable” places and that programming, pricing and other policies should be considered. What Forsyth continuously explains however, is that this is all subjective and the most important aspect is knowing what is being implied in each situation.

Each of the nine themes explained are ways to plan and design environments to be walkable although, not every theme can be applied to any situation. Forsyth

explains each theme more in depth throughout the article. Each term is defined as its relation to the term walkable. “Traversable” is defined as the most basic definition of walkable. While every dictionary has its own definition, the loose synopsis is capable of being traveled by walking. This becomes very subjective and variable depending on the specific instance and characteristics of the user. “Compact” or “close” is a simpler term that can actually be defined regardless of conditions, although can still be subjective. In terms of walkable, compact means, of a distance that is short enough to be walked.” The next term, “safe” is a term on its own, but applies enough to design of environment to be included in the article. “Safe” can be used in the definition of walkable as, a walkable community is one where it is easy and safe to walk to goods and services.” This implies that safety applies to both street design of wide and well maintained sidewalks and crosswalks as well as reduction of crime and physical danger from others. The last of the “means” definitions is “physically enticing.” A walkable area that is physically enticing would be a pedestrian-oriented area with wide sidewalks and crosswalks, storefronts along the streets, trees and vegetation, benches, lights, and more. This term becomes slightly easier to define because it usually is described in project goals to create a more enticing environment. “Lively and sociable” is the first term in the outcome cluster. Similarly to physically enticing, lively and sociable walkable areas have other people walking on the sidewalks, going from storefront to storefront, sitting on the benches, and walking with limited physical purpose. “Sustainable transport option” is however, very different. This term would be used to describe a walkable area as an area where it is most efficient to walk as the primary mode of transportation. This may be in a metropolitan downtown area where it is not very safe, will not have many walking for physical activity and might not be very lively. The last of the outcomes cluster, “exercise-inducing” is quite simple. This is a walkable area that encourages walking for exercise. Places like this may be parks with trails. The final cluster of definitions, proxies, are reserved for places that are more complex. “Multidimensional and measurable” describe places that has multiple purposes that can be measure. Walkscore has come from this definition of measuring distances and ease of access to different services and amenities from a certain location and pairing it against other nearby or similar locations. The final term, “holistic solution,” is for when someone needs to describe their walkable area as

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complete and are simply better.

It again comes back to everybody having their own definition as Forsyth explains one person has suggested that safety should be the basic requirement for walkability as opposed to traversibility and compactness. As we move forward, Forsyth explores a few options we could potentially reach to further explain these words. There could be a minimal definition and other words developed to further illustrate somebody’s intention, specific terms for different walkable places could be used, such as the ones listed prior, or a more in-depth, comprehensive definition that goes beyond the physical place of walking.

To apply what was discussed to this thesis, some final thoughts are drawn from the article to be followed and elaborated on. Walkable and walkability should be thoroughly defined prior to use of them in a project. It should be clearly know to the audience what the intention is by using these words. The nine themes could be used to help define walkable or walkability in a certain scenario. What the extra, clarifying definition can do is show that this walkable environment is different than others and highlight that there are multiple purposes of walking and that, although a project emphasizes a certain way, multiple purposes can be used and planned for. No two projects or situations are going to be the same and the definitions and explanations should express that. Forsyth includes a matrix table comparing the nine themes and the different interventions they may be shown in. The interventions included are; infrastructure provision, infrastructure design/quality, pedestrian network, distances, activities supported, programming/ policy examples, and measures. This matrix helps those defining their space to understand how it should be defined based on the goals and intention of the designed spaces. The table is included in the appendix and will be used to complete this project and clearly define the intention of the design. To summarize, this article helps to understand why the terms “walkable” and “walkability” are used so often in such different situations and how we can avoid confusion and unnecessary overlap. For this thesis project specifically, walkable will be clearly defined for the audience to avoid any confusion of the intention. This will provide a much stronger understanding of the designed space and more well thought out designs.

Literature Review Summary

Three journal articles were examined and reviewed as the literature review for this thesis project. Each article was selected because it applied to a certain primary emphasis or goal of the project; repurposing a coal power plant, human connections to nature, or community planning. The similarities drawn between the articles revolve around the point that many things are multiple ways to do something. Each article provided framework for how things could be done, *Repurposed Coal Plant Sites Empower and Revive Communities* for example, explains that both planning ahead to repurpose a coal power plant before the plant closes and returning after it has been closed for years are possible, it is preferred to plan ahead. Walkable and walkability can be defined many different ways, it is best to explicitly explain your definition and why it matters. Additionally, *The Psychological Impacts of Interacting with Nature-Based Design* explains that interacting with nature and green spaces have a positive impact on humans and human health, it does not state an ideal natural experience. This thesis design will seek to expand on all of these a provide a strong example of what should be done based on the research findings from these articles.

Differences between these articles came down to explanation methods. *Repurposed Coal Plant Sites Empower and Revive Communities* followed examples and case studies of how those situations were handled and what we learned from them. This method is incredibly helpful as more research can be done outside of the article to build on the premise behind it. *The Psychological Impacts of Interacting with Nature-Based Design* used other research articles and findings to explain their premise and underlying ideas that provided a strong basis for what they were trying to prove and why. What made this beneficial is every sentence was backed with more research and so much content was included to help define their premise. Also included was a full research study conducted by the authors that provided real life reasoning and validation for their premise and hypothesis. This gave numbers and data explain clearly and concisely to answer their research question. *What is a Walkable Place? The Walkability Debate in Urban Design* took a different approach of gathering beliefs and opinions of others and analyzed the differences between them and how it can be simplified down.

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This method showed how there can be multiple right answers but that whatever your answer is, it should be clearly explained and have strong reasoning to back it up. While each article approached their research differently, having a variety or methods helps to explain the differing topics well and provide an understanding that some methods work better for some topics.

Each of these journal articles on their own provide plenty of information and knowledge to build off of. They each provided basis for a different element of this thesis and explain why and how it should be done in a real life scenario. For this thesis, the intention is to put all of them together cohesively. The biggest takeaways from all the articles were that there are multiple ways to solve these problems but the answer needs to be explicitly and clearly defined and explained and that the primary emphasis of the thesis requires cohesive integration and interaction between multiple major project elements. Components of the project that are done well but disconnected from each other do not accomplish the goals it set out to exceed.

“Human health and wellbeing depend on not only genetics but also the conditions of life.”

- Mahgol Seirafian Badoldashti, Seyedeh Marzieh Tabaeian

RESEARCH SUMMARY

Journal articles, case studies, site analysis, and the historical, social, and cultural context of the site and project premise were all researched and studied for this project and detailed in this document. The project was also justified based on the importance of the major project elements, then a performance criteria was set for the analysis of the completed project. The researched components were each collected for a specific element of the project; adaptive reuse of a coal power plant, interaction and connection with nature, or master planning.

What was discovered through this research was that adaptive reuse projects become complicated because of the unique style of architecture required for this typology and the equipment required. To maintain the history and character of these buildings, designing the spaces should be done based on physically interacting with the existing structure. Buildings of these type and best understood by physically seeing the spaces as well as sections showing the differing floors and ceiling heights.

When it comes to interacting with nature, there is a clear correlation between interacting with nature and physical, mental, and emotional health as well as productivity. This is something that should be expanded on in the final design.

Walkable and walkability have an unlimited amount of definitions and meanings. What becomes important is clearly defining what the goals of the designed environments are as early in the project as possible. This will help to create a full master plan of a community that is truly walkable, healthy, active, and well connected. Master plans are also very intricate and should have clear goals explained as early as possible. Multiple uses woven together becomes critical to create connectivity and not isolate certain services or program elements.

Energy is as old as mankind, with humans always trying to create better and more efficient energy sources. The type of energy being generated also has a large impact on the people it services. Studies have shown that pollution from coal power plants is responsible for countless health issues as extreme as death. Clean, renewable energy has also shown to be just as efficient if not more as coal and the older energy sources we have used.

RESEARCH SUMMARY

What becomes important in this project is connecting these different project elements together to create a holistic design that builds off all the research compiled in this document. Adaptive reuse, interaction and connection with nature, clean energy, and walkability to create connectivity can all be combined to create a strong community in a net-zero energy master plan. The research presented provides a basis for what the design of this thesis should expand on to explain how these project elements can be integrated together to create a well thought out, design.

Figure 9

CASE STUDY

Figure 10

The Powerhouse - Beloit College

Location: Beloit, Wisconsin, United States
Typology: Adaptive Reuse, University - Athletic Center and Student Union
Architect: Studio Gang

“Located along the Rock River, adjacent to the College’s campus and close to downtown Beloit, the Powerhouse project combines an assemblage of historic buildings that made up the Blackhawk Generating Station (constructed between 1908–1947) along with a new field house addition. The design retains architectural features and industrial equipment from the original structures while incorporating new sustainable practices and lively gathering spaces that encourage students to mix with each other and the larger Beloit community.” - Studio Gang

THE POWERHOUSE

The Powerhouse on Beloit College’s campus is an adaptive reuse project that converted an old coal power plant into a student union and athletic center. The primary goals of the architect were to maintain the historic landmark’s structure and character, achieve LEED certification (silver), and to create a center for healthy living, in a building that used to burn coal. As the building was old and made for machines, there were numerous issues such as, floors not lining up, spaces that did not make sense, and an overall structure not designed for people. Studio Gang looked at each space and imagined what could occur there and made every attempt to keep as much of the original building as they could, including the coal hoppers and chimney tower. The new addition on to the building is meant to continue what the historic building shows of tall skinny windows and creates a modern addition, without detracting from the history. The building also uses energy from the river to heat and cool the building as an on-site renewable energy source.

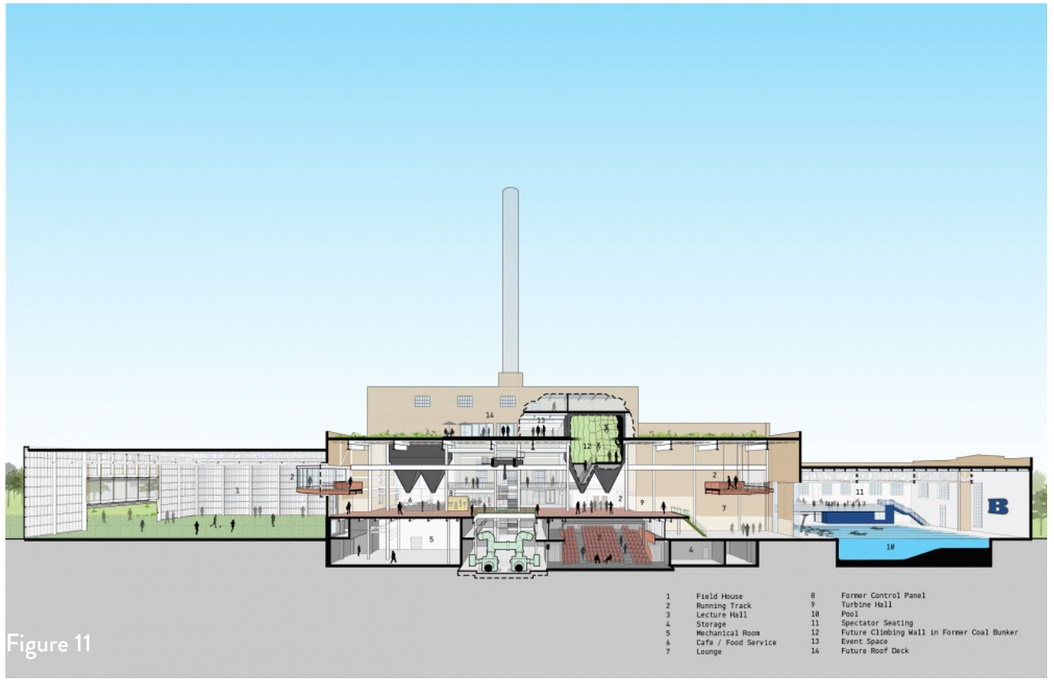


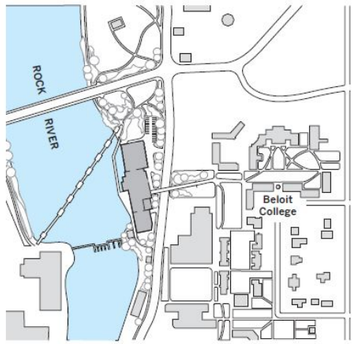
Figure 11

CASE STUDY

Program

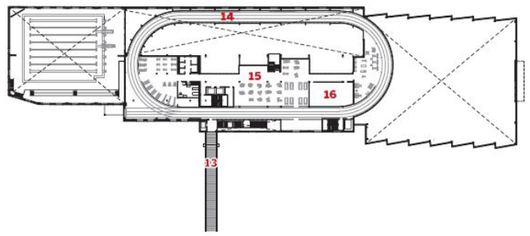
Athletic Center and Student Union including:

Collaborative meeting rooms/seminar rooms/work tables
Informal gathering spaces, nooks, hang-out space
Indoor running/walking track
Signature lecture hall/theater for presentations/films/receptions
Competitive pool
Café
Fieldhouse with artificial turf floor
Conference center
Multiple fitness spaces
Outdoor decks over the Rock River
Health & Wellness Center
River walk



SITE PLAN

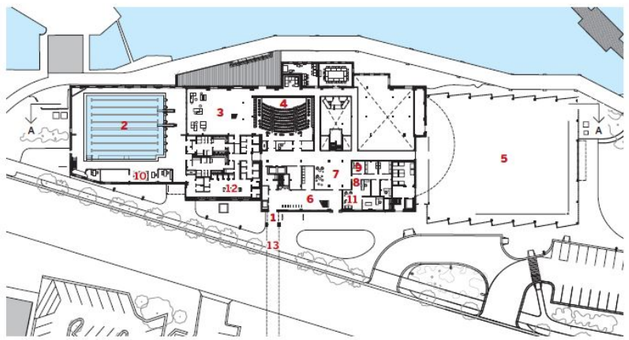
0 300 FT. 100 M.



LEVEL 3 PLAN

0 50 FT. 15 M.

1 ENTRANCE
2 POOL
3 LOUNGE
4 LECTURE HALL
5 FIELD HOUSE
6 WELCOME CENTER
7 LOBBY
8 RECEPTION
9 OFFICE
10 CLASSROOM
11 CONFERENCE ROOM
12 LOCKER ROOM
13 BRIDGE
14 TRACK
15 FITNESS AREA
16 GROUP EXERCISE
17 CAFÉ POD
18 CONFERENCE CENTER
19 EXISTING COAL BUNKERS
20 STUDENT CLUBS



GROUND-LEVEL PLAN

Figure 12

THE POWERHOUSE

Figure 13

Daylighting

In the new addition, full height windows were installed between translucent panels (the primary facade material) that allows a large quantity of natural light into the space while reducing glare and direct light. With the interior space being the athletic fieldhouse, controlled and not intense light is important. The translucent panels on the addition are kept simple to avoid taking attention from the historic main building.

For the original, repurposed brick building, windows were replaced with similar styles to modernize the building and space while still holding the original character. This also adds to the difference between the two buildings to accentuate the historic importance of the main building.

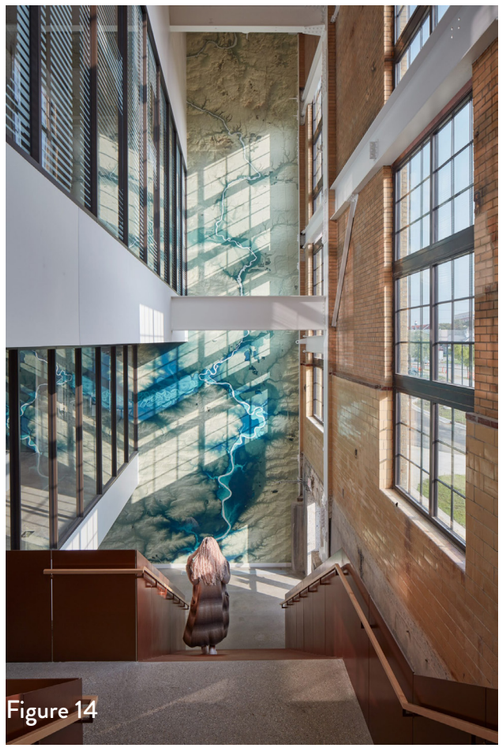


Figure 14

CASE STUDY

New v.s. Old

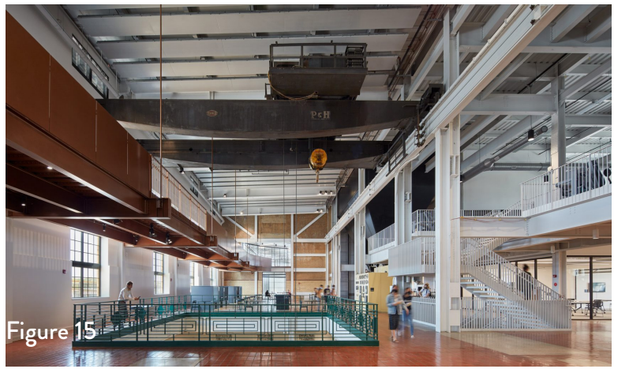


Figure 15

Since the original building was designed as and for a coal plant, there were multiple spaces and floors that did not work well for people. These elements were kept and expanded on to show the history and authenticity of the building. Solving the issue of how to fill these spaces and where to put everything came down to physically seeing the spaces and section. These two solutions prove to be the most valuable for repurposing and renovation because that is how you can collect the most information about an already built space. Some irregular spaces were filled or added on to while others were removed or applied to other spaces. These irregularities allow for more light throughout the spaces, more interaction between students, and serve as a learning opportunities for students and users of the space to learn about history and different building types. A skyway was included in the design to connect the building to the rest of the campus and literally bridging the gap between old and new.


Figure 16

THE POWERHOUSE

Summary

The Powerhouse at Beloit College proves to be a well executed project of converting a coal power plant to a completely different, new typology. What this design project does well is keep the history and integrity of the original building while both modernizing it and adding on. Based on the major elements of the project, it can be assumed that the design team emphasized keeping the building as close to the original as a learning opportunity for the users of the space. Having this building on a college campus sparks the interest of young adults to learn more about our history and how we have changed over time, specifically in terms of energy and buildings. This building focuses on being environmentally friendly by removing the negative effects of a coal burning plant, considering heating, cooling, and daylighting heavily, and incorporating hydro power from the river. The social benefits of the project include an expansion on community and athletic/wellness spaces and building the college community it is part of. Culturally it increases the awareness of historical buildings as well as the negative effects of our past. Politically this building helps to redevelop a dying area of a community and city.


Figure 17

CASE STUDY

Figure 18

South Gate Masterplan

Location: Budapest, Hungary
Typology: Master Planning
Architect: Snøhetta

“Snøhetta’s proposal for a new city district on a brownfield site in the Hungarian capital of Budapest centers on the deliberate use of water to define the site and drive its environmental approach. Designed for density, this urban vision creates a distinct identity for this new urban quarter next to the water.
Snøhetta’s masterplan for a new district, located only a few kilometers south of the city center, involves water as an element that shapes the city, and creates a vibrant space in direct relation to the river. The new district of the city, which is being built on a 135-hectare urban wasteland, is given the character of a peninsula.” - Snøhetta

SOUTH GATE MASTERPLAN

The Budapest South Gate Masterplan is a 335 acre development of a brownfield site along the Danube River. The masterplan focuses on future users while tackling current issues like climate change, hence the development on a brownfield, rain water recycling system, and a sustainability emphasis. Through a variety of different uses, approximately 16,000 people will live within the development and 15,000 more will work there. A majority of the residents will be students to account for the rising population and struggles of young adults at the beginning of their careers. Transportation is also a heavy focus for this project with an emphasis places on pedestrians, bikes and public transport systems, which align with the sustainability focus.

Figure 19

CASE STUDY

Program

The program is a masterplan containing many different typologies and elements. Some of the primary elements include:

Housing
Retail
Public Space
Education
Recreation
Athletics

Figure 20

SOUTH GATE MASTERPLAN

Water

Figure 21

A major aspect of the masterplan is water, both in terms of an object and a design element. To start, the entirety of the project focuses around the Danube River, as well as channels running throughout the project and into the mainland. With that in mind, direct connections to the river and channels were designed into the project through multiple river walks and public watercraft access points. As students are the primary resident and user of the community, there are many opportunities to interact with the water.

In addition to water being an interactive element, an intricate water recycling and treatment system was implemented. The river along the site is polluted, yet serves a high volume of users every day, causing clean water to be of higher importance. Rainwater and surface water is collected on site, treated and reused on site or deposited back into the river, cleaner than when it exited.

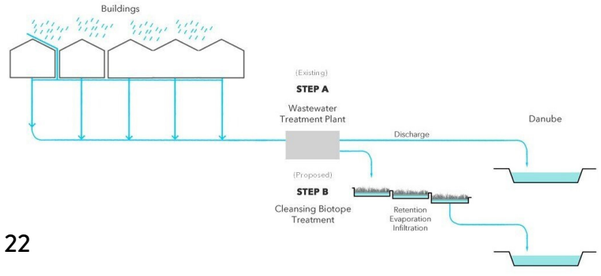


Figure 22

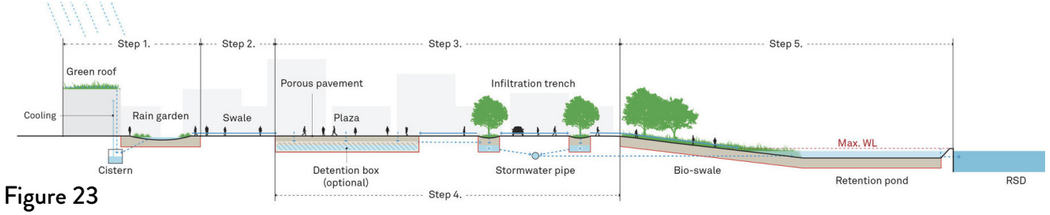


Figure 23

CASE STUDY

Character

Snohetta wanted to make the entire community comfortable to be in. Public, green spaces, paths, pedestrian focused streets are just some of the strategies used to create a more comfortable, walkable and lively community. In the newer age of carbon reduction and healthy living, these strategies are becoming exponentially more important. Throughout this project, a resident would not need a car, could go for walks and runs each day within the community and study for classes in a park on a sunny day. Especially for a master plan, user comfort takes top priority. Landmarks become an important element as well as a gathering space, wayfinder and identifying point. A cultural building (pictured right) is placed at the point of the peninsula and at the end of a street (pictured below) as a way to know you have arrived at the site and know which direction you are heading.

Figure 24

Figure 25

Figure 26

SOUTH GATE MASTERPLAN

Summary

Integration was key for Snohetta designing the Budapest South Gate Masterplan. There are thousands of residents with a majority being students. Thousands of additional users working there everyday. Thousands more coming for recreation on a daily basis. Multiple different uses were designed from housing to retail to recreation. Sustainability was a heavy emphasis in all facets of the design. All of these things cannot happen in its own world. Each element relies on the others to work well together and cohesively. Integration and connections become the identity for this project. All the buildings blend well together and do not stand out much against each other, making for a cohesive design that does not become distracting. This masterplan sets the standard for what we will be looking at in the future. Sustainability, integration and user comfort and happiness are major project elements that are done well and easily identifiable throughout the project.

Figure 27

CASE STUDY

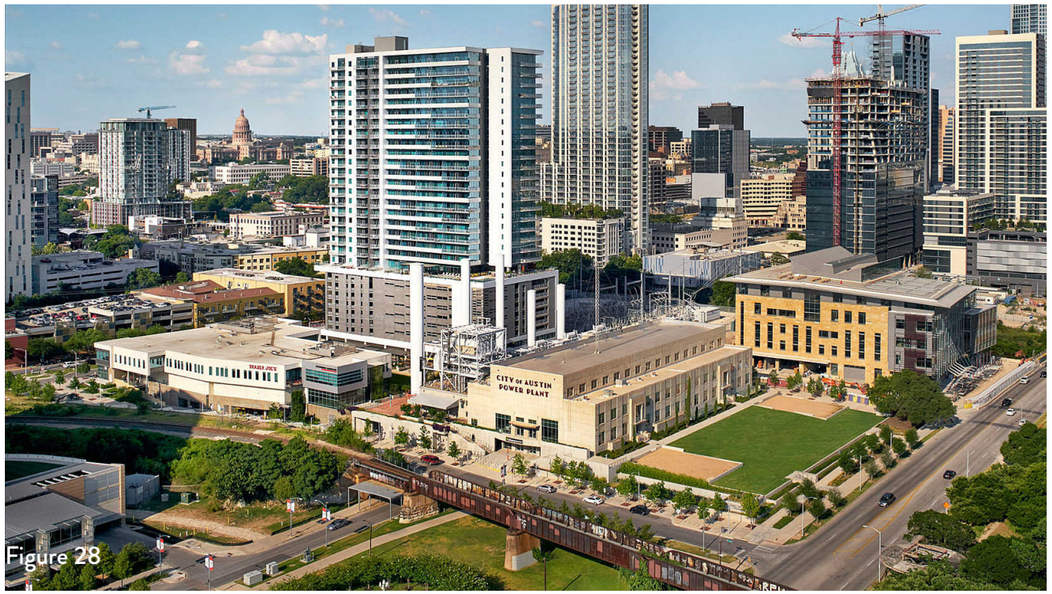


Figure 28

Seaholm Power Plant

Location: Austin, Texas
Typology: Adaptive Reuse, Master Planning
Architect: STG Design

“Seaholm is an urban oasis on the Southwestern edge of downtown Austin. An architectural gem built in the 1950s, the long-dormant power plant offered a unique opportunity to preserve a key piece of Austin’s past and unite it with the region’s vibrant future. Thanks to a unique partnership with the City of Austin, Seaholm combined cultural and community needs in an exceptional setting for residents and visitors to enjoy for generations to come.” - Seaholm Power

SEAHOLM POWER PLANT

The Seaholm Power Plant was built in the 1940s and 1950s originally as a coal power plant, although only ever used fuel oil. It became a trend setter for the area as much of the architecture in the city reflects the art deco style the power plant has. While it closed in the 1990s, it was still strong and in great condition. Seaholm Power, LLC stepped in and was chosen for development of the power plant and adjacening sites. Their vision was to repurpose the power plant and add a high-rise residential tower, smaller commercial building and a parking garage among the eighty acre site. To keep as much of the history as possible, the turbine hall, some of the original boilers, and the cooling towers were all kept. The design integrated some historical features from the old power plant building into the other new buildings.


Figure 29

CASE STUDY

Program

Housing
Commercial Office Space
Retail and Restaurants
Plaza
Public Space

Figure 30

The original structure and form of the old power plant were kept as close to original as possible with the other buildings added following what was there. Throughout the three structures, a variety of retail, restaurants and entertainment can be found as a way to create a new district in town. With the addition of the new high-rise residential tower and commercial spaces, new life is brought to this area, bringing in full time residents, full time employees, and the every so often recreational user. The residences specifically have numerous amenities included as well to attract potential residents. All that is included is intended to be as sustainable as possible, following the theme of removing the old, polluting building use and replacing it with the new age of architecture and living.

SEAHOLM POWER PLANT

Summary

What this project does well is restore the history of the power plant while building new, inspired from the history. This building was a starting point for much of the city and it makes sense for it to be the starting point for the new developments going up in the city. With sustainability being a the forefront of this project, users are able to learn about the history of their city while enjoying the new spaces made just for them. The new power plant no longer feels like a power plant, but it is still easy to see it's there with all the elements left such as the cooling towers and boilers, but it is comfortable for people as not many would like to eat dinner in a factory.

Figure 31

Figure 32

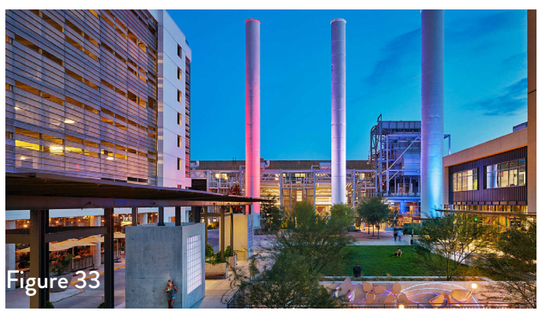


Figure 33

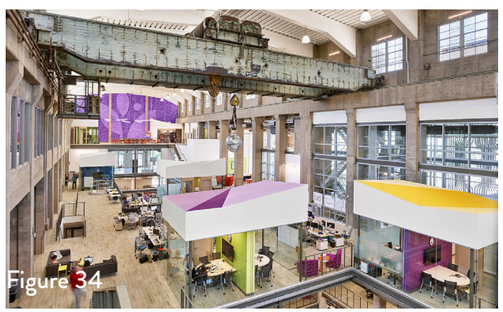


Figure 34

CASE STUDY

Case Study Summary

All three case studies have a few things in common. They all focus on sustainability, incorporate some adaptive reuse or brownfield mediation, and apply in some fashion to this thesis. With the repurposing and renovation of a coal power plant being the primary emphasis of this thesis, case studies doing just that were chose. The Beloit College Powerhouse project excellently shows how this can be done while factoring in all the irregular elements that are encountered in a project like this. This project also bring in hydro power, really looks at how it connects to the community and provides well designed spaces for those who need them, and is able to build a new, modern building attached to a old, historic building without it standing out or taking over.

Budapest South Gate Masterplan looks at a different aspect of this thesis, the new development masterplan. With the site for this project being a brownfield along a river, the connection is evident. The major takeaways from this project is how to develop a massive community without designing the exact same building over and over again, being sustainable on a large scale, and designing a connection to a river that otherwise is unreachable. The approach taken here is less of flashy amenities and more of showing what the community can do for you and your health in a positive way and be a leading force into the future of new developments.

Seaholm is a slightly different type of project that applies less to the thesis, but still provides valuable information. This project also repurposes an old power plant but it also adds a large high-rise residential tower, as opposed to smaller scale buildings. Seaholm does show how to incorporate historical elements of one building into a new building without being repetitive.

All these projects had similar goals in mind in the social, cultural and physical premises being to design spaces for people going into the future, build our culture and society by teaching history, sustainability, and connection, and to improve the environment through the architecture. They all apply to this thesis either through adaptive reuse, masterplanning, sustainability, or connections.

SUMMARY

Figure 35

Figure 36

Figure 37

PROJECT JUSTIFICATION

Our world is at an important crossroads. We are finding the way we have been living our lives is not sustainable and has been negatively impacting our lives and environment. Removing all the negative practices of our past while building forward is more important than ever. Looking locally, when this coal plant closes, it will cause numerous problems that could negatively impact the surrounding area in many ways for a long time. This site needs remediation immediately to clean up all the pollution done over the years without it affecting the river. If left untouched, the pollution will sink more into the earth and making it more difficult to clean later as well as leaving empty buildings and infrastructure to crumble away. The economic impact of the plant's closure would be extreme as well. Thousands of jobs would be lost which would cause people to move away to chase jobs. Redeveloping creates more opportunities than there previously was to not only keep current residents and workers but bring more people in.

Completing this project will help the area grow and expand in a positive way and connect the area to the nearby metro of Minneapolis/St. Paul through new transit and development. The goals of the project provide the justification for this project themselves. There are many negative affects connected to the project site and the inevitable future of the area if nothing is done. The completion of this project would provide such an economic boom that justify public and government funding options as well as potential private donors. Along with the economic boom, this project would provide the area population increases, education and healthcare growth, health benefits, recreation opportunity increases, public transit expansion, among many other smaller benefits.

To the architecture and academia professions, this project will teach others how we need to change, why we need to change, and how to be creative in our new developments. Sustainable design is not black and white, there are many design solutions that are incredible sustainable or carbon neutral that still appear to be a regular building. Recovering old buildings that are still strong can and should be used as the starting point to build off of in new developments. Old factories, power plants, and polluting buildings can still be used to change our future.

PROJECT JUSTIFICATION

Personal Importance

I have lived in this area all my life and have always been curious as to how the building works with the tall smoke stack. Through my academic career, I have come to see sustainability in architecture to be of high importance in our society right now. We have been trending the wrong way for a long time and working to change that through architecture is how I feel I can personally make a difference and positive impact in this world. It can be hard to single handedly influence the world or make a difference at this stage in a career. I believe this project will also allow me to showcase my knowledge of architecture and how spaces are put together and designed. I will also be able to demonstrate my technical skills through digital models and drawings.
While I intend to teach others with this project, I will also be learning a lot myself. How energy plants work and operate, collecting renewable energy, adaptive reuse, and large scale master planning are a few topics I will be learning more about throughout the research and design of this thesis project.

Figure 38

History of the Site


Figure 39

1992
Surrounding site has become developed with still minimal traffic traveling near the site.

2012
Area has modernized and become faster, more developed, and established.


Figure 40


Figure 41

2018
Recent flood crest of 86 feet (94 feet is record flood in 1965).

2020/Present
New highway bridge project completed. Incredible traffic increase and more visible to the public.


Figure 42

HISTORICAL CONTEXT

Energy History

1839
Photovoltaic effect discovered by Edmond Becquerel.

1882
First coal plant in the US, Pearl Street Station, opens.

1927
Commercial sale of wind turbines begins to US farmers.

1965
Landmark report from US president Lyndon B. Johnson released detailing harmful effects of fossil fuel emissions.

Early 1900s
Renewable energy production and use begins.

1968
Xcel Energy opens Allen S. King coal burning power plant.

1860s
Fears of running out of natural resources begin.

Mid 1900s
Coal becomes leading fuel for generating electricity in US. Renewable Energy use expands.

HISTORICAL CONTEXT

1993
USGBC is founded to create a green building rating system.

2007
Most coal burned in a single year in US, 2,016,455 GWh.

2010
Rapid decline in coal burning begins with plant closures.

2020
Coal power drops to 10% of US electricity production, lowest since mid-1800s.

2009
Living Future Institute is founded to create a socially just, culturally rich, and ecologically restorative civilization.

2028
Xcel Energy to close Allen S. King Power Plant.

2006
AIA issues 2030 commitment to have all buildings be carbon neutral.

2013
International WELL Building Institute founded to create safer spaces and healthier communities.

Social Context of Nature

The human connection with nature has been existing since the dawn of time. As society has developed, industrialized, and urbanized, the inherent need for nature's resources has decreased. This left humans and nature two separate entities rather than a intertwined connection. As of recently, more people are introducing themselves into nature recreationally, whether that be through hiking, swimming, or simply exploring. We have seen more research released showing the benefits and correlations of being connected with nature. People are happier and suffer from less mental illnesses, creating a friendlier and more productive society. Recovery rates for illnesses are quicker in those who interact with or simply see nature during their recovery. Employees are more productive if they are able to spend time outdoors during the week, lessening the need for overtime and overworking. Those who spend more time outside being active show less physical illnesses such as obesity, joint problems, and cardiovascular issues. Overall, spending time in nature and being active correlate to healthier, happier, and more productive people and thus a stronger society or community.

Figure 43

Social Context of Clean Energy

In addition to all the environmental benefits of using clean, renewable energy, there are many social and economic benefits. Clean energy first and foremost creates a cleaner planet which correlates to healthier and happier people. When people are less worried about their planet and environment, they are able to be focused on other matters and feel happier. The increase of clean, renewable energy has also brought the overall cost down and increased availability, meaning that anybody can purchase renewable energy sources privately for their own property, such as solar panels. This helps to educate the general public on the benefits of clean energy and why large scale renewable energy implementation should happen. On a large scale, more jobs are created for renewable energy source production and maintenance as well as research of more efficient sources. These societal and economical impacts provide a strong basis for a thesis involving integrated renewable energy for users to interact with.

Social Context of Community

Close communities are similar to nature in relation to humans as they are both inherently human. Humans started their time on Earth in small groups, always staying together. As is the case with nature, communities have become and fewer and less connected as society became more urbanized. Urban sprawl was a failed attempt at creating communities in a slower and quieter location than the busy, downtown districts. The issues with suburbia and urban sprawl are that people actually become more distant because they are disconnected from others. They have to drive long ways to get places, are separated into small lots that repeat themselves for long stretches of road, and are not focused around anything. Creating communities based around a focal point with various opportunities to interact and integrate together provide a much happier community. These strong communities give people a sense of togetherness and support. Each person picks up where someone else left off to bring everyone together and feel like a whole machine, rather than pieces to a puzzle that don't go together.

SITE ANALYSIS

Figure 44

SITE INFORMATION

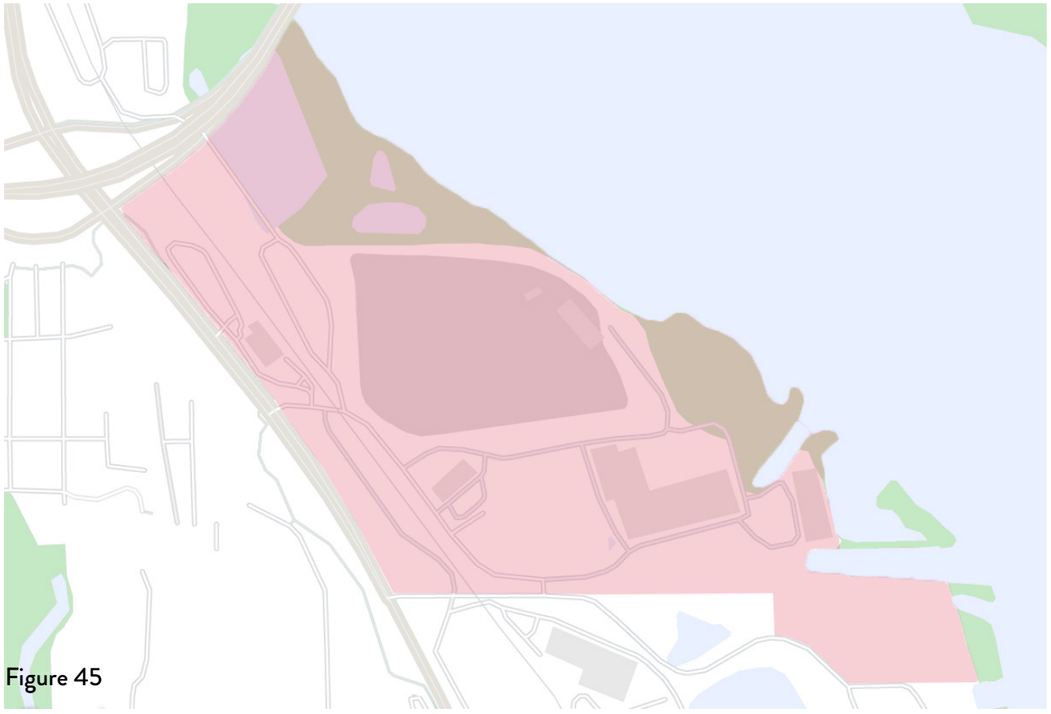


Figure 45

The site is a very large portion of land, all owned by Xcel Energy, along the St. Croix River. Nature and vegetation occupies a large percentage of the site, with wildlife frequently visible among the trees. Surprisingly, the site is relatively flat, with the only variations coming from building footprints and coal piles. Although the site is along two major highways, the feeling within the site is calm, quiet, and peaceful. Birds can be heard chirping, residents of the nearby neighborhood can be seen walking their dogs, the sun peaks through the tall trees in the winter months and cascades onto the site in the summer months. The current structure of the coal plant itself stands menacingly, yet welcoming, as there is little to no noise disturbance. A series of power lines extend from the plant, going both east and west, a sign of the strength of building. A nearly 800 foot tall smoke stack draws eyes from miles away, and attracts those nearby. The river sits right along the site, but does not impact the site in the summer and winter, only occasional springs during a flood. Overall, the site sits peacefully, while still showing its strength.

SITE INFORMATION

Figure 46

An unapproachable area, the site does not appear to have any signs of intentional destruction. Portions of the site show signs of abandonment and disarray, but no damage has occurred. A neighborhood sits tucked away to the south of the site in its own world, unbothered by the large, industrial buildings right next door. A sense of community next to the brutalist power plant. None of the areas surrounding the site connect to each other well, everything appears to be designed without any thought given to its surroundings. Roads, paths and parking lots are all in good shape and appear to be used regularly by workers. Small peaks of beauty sit tucked between trees if you look hard enough. The entire north half of the site is unaccessible without trespassing down one road, yet there used to be public river access with the roads and beaches still existing. From the river, the site appears tucked away, with no desire to go near an industrial site. Beautiful trees line the river bank and provide picturesque views in the fall as colors begin to change. The site sits peacefully, yet menacingly. Welcoming, yet uninviting. Great potential and opportunity is clearly there.

SITE INFORMATION

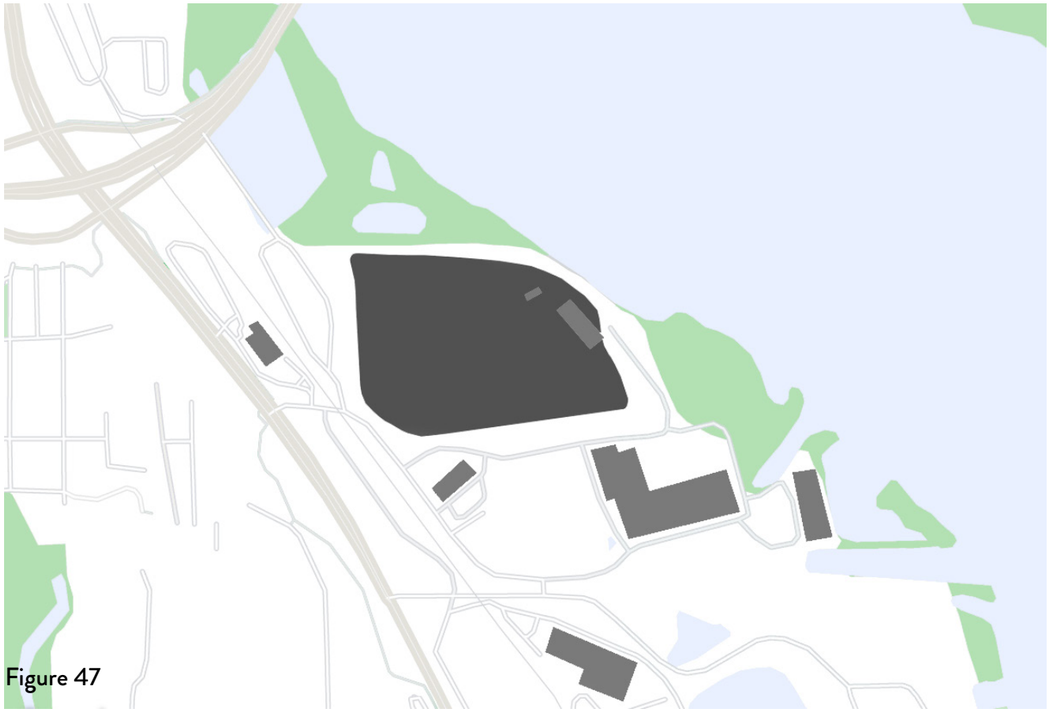


Figure 47

Existing Buildings

Hazards

Existing Buildings and Hazards

Currently on the site is the large power plant building, a number of small, satellite buildings, a coal field, and many large power lines and structures. Most of the buildings are made from concrete and/or corrugated steel siding and roofing. All the satellite buildings are nearing the end of their life if not already. Although, none of these buildings currently pose a public safety threat. The coal field is the primary hazard of the site for obvious reasons. It encompasses one-third of the ground area, is unappealing, and is dangerous to people, wildlife, and the environment. Train tracks also occupy part of the site as coal came to the site via train. Andersen Windows will be phasing out the use of coal and trains in the near future leaving the tracks unused. They are still in good condition to be kept for other purposes or removed.

SITE INFORMATION

Figure 48

The existing buildings on the site are very disconnected and create a mess of small access roads. Each structure besides the power plant is only one story and near the end of its life. There appears to be no viability in keeping all these buildings.

The coal field becomes a primary focus for this project. It currently covers one-third of the site and has no safety measures in place to keep people and wildlife out. Safe removal of the coal field is crucial to this project's and site's success.

Figure 49

With an 800 foot tall smoke stack protruding from it, the main power plant building is a large, concrete block with little appeal to it currently. It provides potential for reuse with its location, size and durability.

Massive power lines and power structure extend from the main building away from the site. While these are dangerous and an eyesore, if power production is kept at the site, they will be necessary to keep. A redesign of how they work could be done.

Figure 50

Figure 51

SITE INFORMATION

Figure 52

Vegetation Trees Water

Nature

Trees and natural, native vegetation covers a large portion of the site. The tall trees protect the site from strong winds off the river and provide plenty of safety and habitat for wildlife on the site. Deer, beavers, and other animals can regularly been seen wandering their way through the trees. Trees and vegetation of this site also reduces noise pollution from the Andersen Windows factory to the south and the major highways to the north and west. Sunlight is still able to penetrate through the trees into the site most of the year, with the few winters months being the exception. The St. Croix River sits along the eastern border to the site, a major part of this area's environment as well as a major recreation attraction. Throughout the summer, numerous boats occupy the river. Every few years, the river floods in the spring. This flood has been known to damage homes and businesses and last well into summer.

SITE INFORMATION

Figure 53

The site is home to a variety of different vegetation species as well as numerous small pools of water. Much of this water may be polluted due to the coal use on site. The different grasses, trees, and water give the site a natural beauty that is often overshadowed by the large mass of the power plant. Many animals rely on the native vegetation on the site for food and safety.

Figure 54

Figure 55

On the southeast corner of the site sits an open field surrounded by trees. This area has been designated as a pollinator habitat and is home for some of the wildlife in the area. It sits along the water, although higher, not allowing for clear views of the river. As this area sits away from the main center of the site and power plant, it would be most logical to leave it untouched and keep it a natural wildlife preserve.

Figure 56

The river plays an integral role for this site. It can be both pleasant and beneficial and menacing at the same time. River users often stay away from the shoreline of the site due to worries of polluted waters, hazards below the surface, as well as changing shoreline. While the river is beautiful and runs along the site, it is disconnected from the site thus keeping the site unknown to the typical river user.

SITE INFORMATION

Figure 57

Major Roads Minor Road Train

Circulation

Major highways border the project site to the north and west. Each of these handle a high volume of vehicular traffic every day, although very minimal bike and pedestrian traffic. Throughout the site are a number of small service roads that only serve the purpose of getting people to one of the buildings on site. Train tracks run through the west half of the site, although used only for coal. Overall, there is very minimal pedestrian or bike circulation on or around the site. There is heavy vehicular traffic around the site, although very minimal within the site. The train tracks only served the purpose of transporting coal, never people, so once the tracks are no longer in use, there will be no change in circulation. The entire site needs upgrades and improvements to the infrastructure of all types, vehicular, pedestrian, and bike both into the site and around the site itself.

SITE INFORMATION

The major highways to the north and west of the site are very disconnected from the site. People drive by at high speeds, only looking to the site for the smoke stack. These roads are unlikely to change so how they interact with the site will need improvements. Each highway brings people from far away, as one serves as a major corridor across Minnesota and Wisconsin, and can bring numerous people to the site easily each day.

Figure 58

There are numerous small roads scattered throughout the site. Pictured is Point Road, which is the only road to the neighborhood peninsula to the immediate south of the site. This road is small and intimate enough to slow cars down and feel comfortable walking along. Large trees frame the road and create small pockets to look out to the river from. The other small roads do not have this same character and are industrial and brutal feeling. People were seen walking dogs along Point Road, but would stop and turn around or go a different direction once reaching the other roads. A lack of consistency and connection is hurting the walkability and circulation among the site. Point Road can be used as a model for how minor roads should be in the project, when those such roads are necessary.

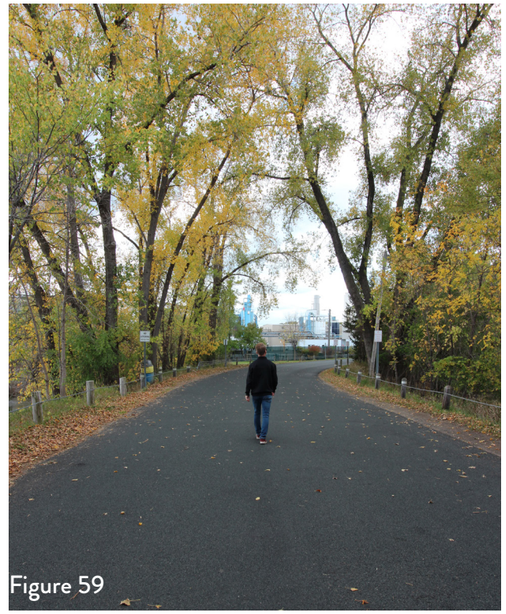


Figure 59

Cutting through the middle of the site are train tracks that sit mostly unused already. Branching off from the primary tracks are a few auxiliary tracks leading into a building or area. These tracks are already abandoned and overgrown with vegetation. However, these tracks actually connect to each other and different points among the site well. They could be reused once hazards, such as broken pieces, are removed.

Figure 60

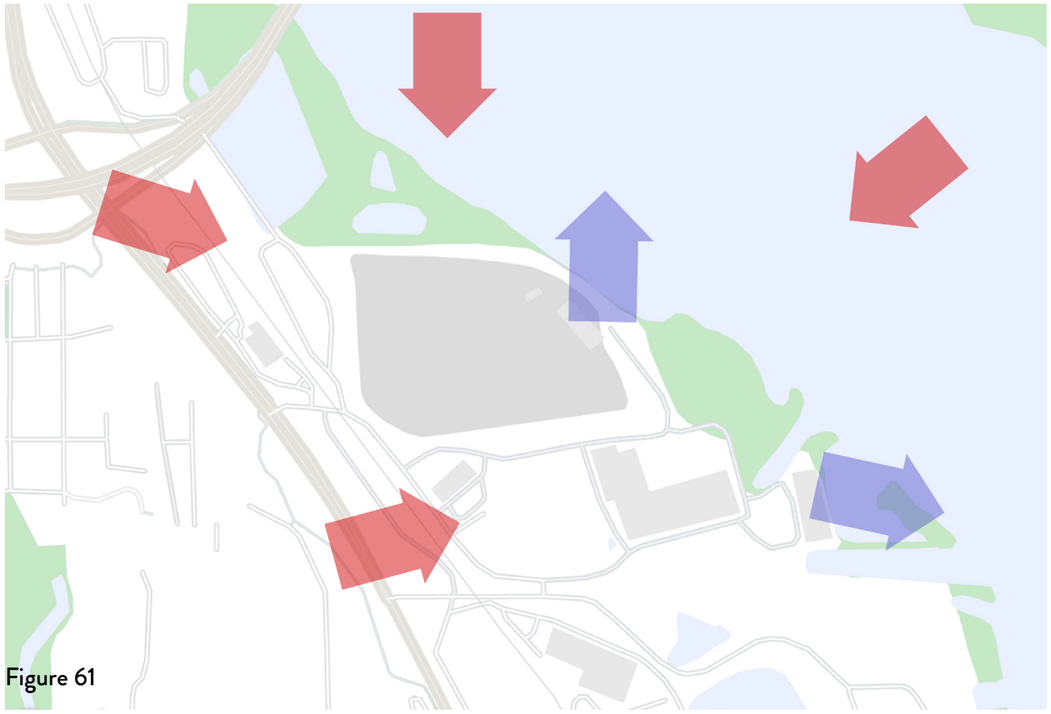


Figure 61

Views

While trees cover a majority of the site, the opportunity for views still exist. The highway to the north exists as a bridge over the river, thus allowing a high point to look down into the site from. West of the site sits at a higher elevation than the site, thus providing a great vantage point to view the site with the river serving as a backdrop.

Once on the site, the feeling is suddenly more intimate with the plentiful tall trees surrounding you. Views are not great however, opportunity for views sits on the east and north looking out over the river. This could provide some interesting design strategies of maximizing those views while still optimizing views into the site.

Figure 62

While on the site, views out to the river are minimal from accessible areas. Most of the open areas are unsafe or blocked by other obstructions. Looking out from a building however, would provide fantastic views over the trees to the river. The best ground spots for views out sit on the southeast point and the northern half of the site.

Figure 63

The view of the site from the Highway 36 bridge to the north is phenomenal. You are granted a clear shot of the entire site with the only obstruction being the rail on the bridge. While on the river, the views are the same, unobstructed. However, on the river, all you can see are trees, the smoke stack, and occasionally a small amount of a building between the trees. The highway bridge remains the best viewing point into the site from any angle. It is still a highway however and there is no place to stop and look. On the north side of the bridge is a wide path that is part of the St. Croix River loop trail. This trail never gets to the project site.

Figure 64

On the highway to the west of the site, you are able to see parts of the site between the trees. It is very obvious there are buildings there but if you don't look closely you may not actually see what is going on at the site. This also is a highway with minimal stopping points and serves as a thoroughway.

SITE INFORMATION

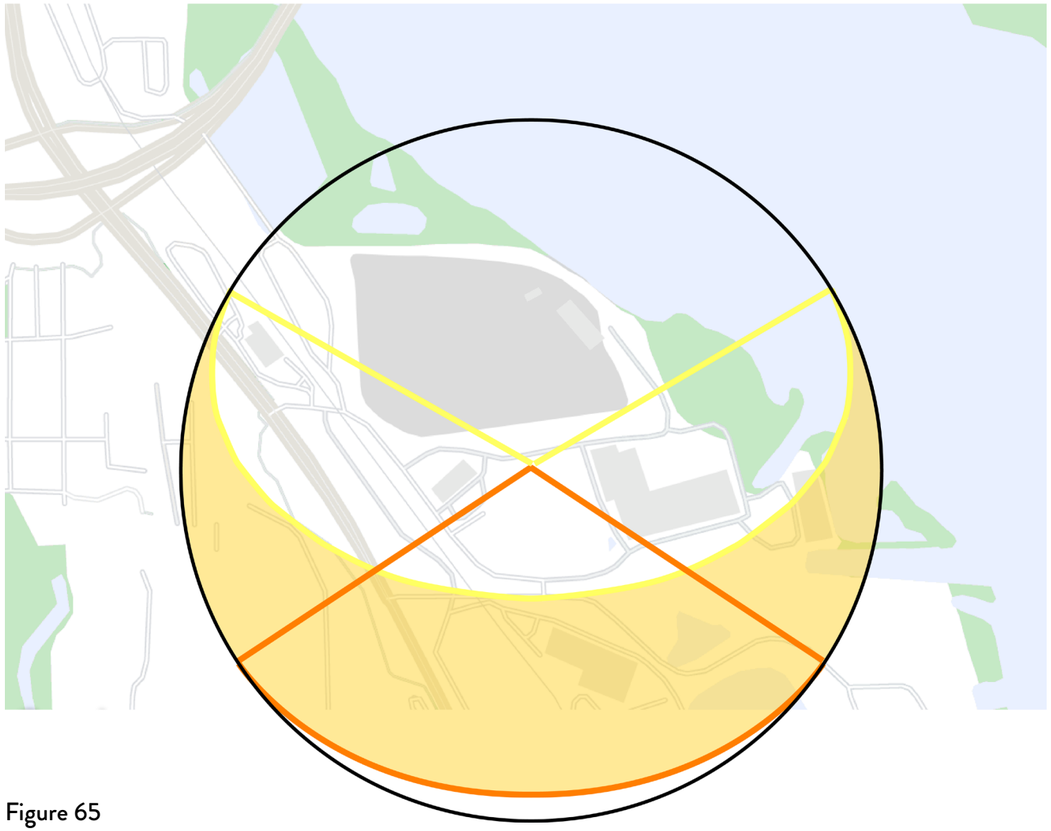


Figure 65

Summer Solstice Winter Solstice Rest of Year

Sun

Stillwater, Minnesota has a wide difference in daylight hours throughout the year. At the summer solstice, there is 15 hours and 38 minutes of daylight, with the highest altitude point of the sun being 69°. At the winter solstice, there is 8 hours and 46 minutes of daylight with the highest altitude point of the sun being only 22°. This means during most of the year, there is strong sunlight throughout the site, however during the winter months, the sun is lower and blocked by trees and buildings.

SITE INFORMATION

Temperatures

Yearly Average High: 56°
Yearly Average Low: 36°

July Average High: 81°
July Average Low: 62°

January Average High: 24°
January Average Low: 9°

Precipitation

Average Annual Precipitation: 34 inches

Average Annual Snowfall: 49 inches

Wind

Stillwater is a windy area being on a river. As with any northern city, winter winds come out of the northwest and summer winds come out of the south. Minnesota is known for its brutal winters as shown by the January winds, which are incredibly strong and gusty. On site, winds come off the river from either the north or south, depending on the day/season. These winds are typically gust based and not sustained.

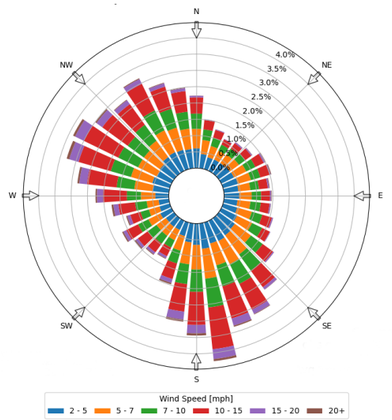


Table 2 Yearly Winds

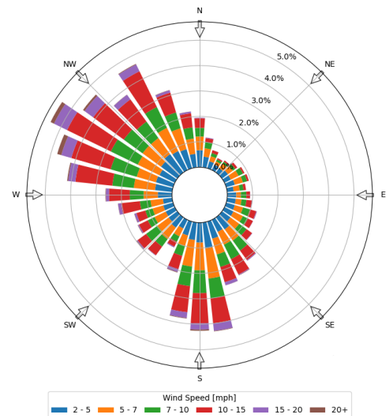


Table 3 January Winds

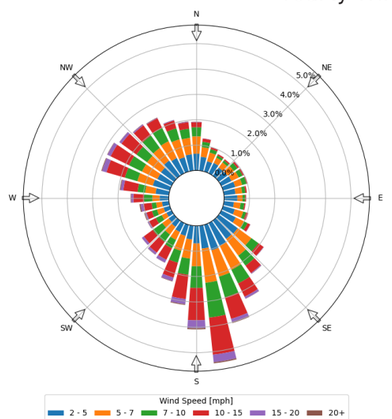


Table 4 July Winds

SITE INFORMATION

Figure 66

Contours and Water

While it is not drastic, the site is sloped down to the water. The highest point, in the northwest corner, is approximately 715 feet, with the lowest being the river bank at 680 (where the river typically sites). The river does flood somewhat most years although, after research, the main power plant building and a majority of the site is safe. However, most of the south and north ends would flood as those areas are lower fields and grasslands.

Flood Levels:

Minor: 687 Feet
Moderate: 688 Feet
Major 689 Feet
Historic: 694

SITE INFORMATION

Water Quality

The water quality of the St. Croix River is very good and is considered to be one of the most pristine in the Midwest. Since 1976, sediment, phosphorus, and bacteria levels have decreased and since 2010 nitrogen levels have decreased.

Soils

On river banks, soils are typically less dense and more sandy. The site contains 5 different soil types:

1039 - Urban Land - Geomorphic Position: moraines
1027 - Udorthents, Wet Substratum - Geomorphic Position: moraines
1033 - Udifluvents - Geomorphic Position: shorelines
151 - Burkhardt Sandy Loam (90% Burkhardt, 4% Dickman, 3% Sparta, 3% Hubbard)
- Geomorphic Position: outwash terraces
540 - Seelyeville Muc (85% Seelyeville, 8% Cathro, 7% Markey)
- Geomorphic Position: depressions

Vegetation

Native plants to the area include many deciduous and coniferous trees, shrubs, and grasses. Some of the more prevalent trees are:
Birch, Oak, Aspen, Maple, Elm, Ash, Dogwood, Poplar,
Balsam Fir, Pine, Spruce, Red Cedar

Figure 67

Figure 68

Video

Scan or click the QR code for a site video.

SITE INFORMATION


Figure 70


Figure 72


Figure 74


Figure 69


Figure 71


Figure 73


Figure 75

SITE INFORMATION

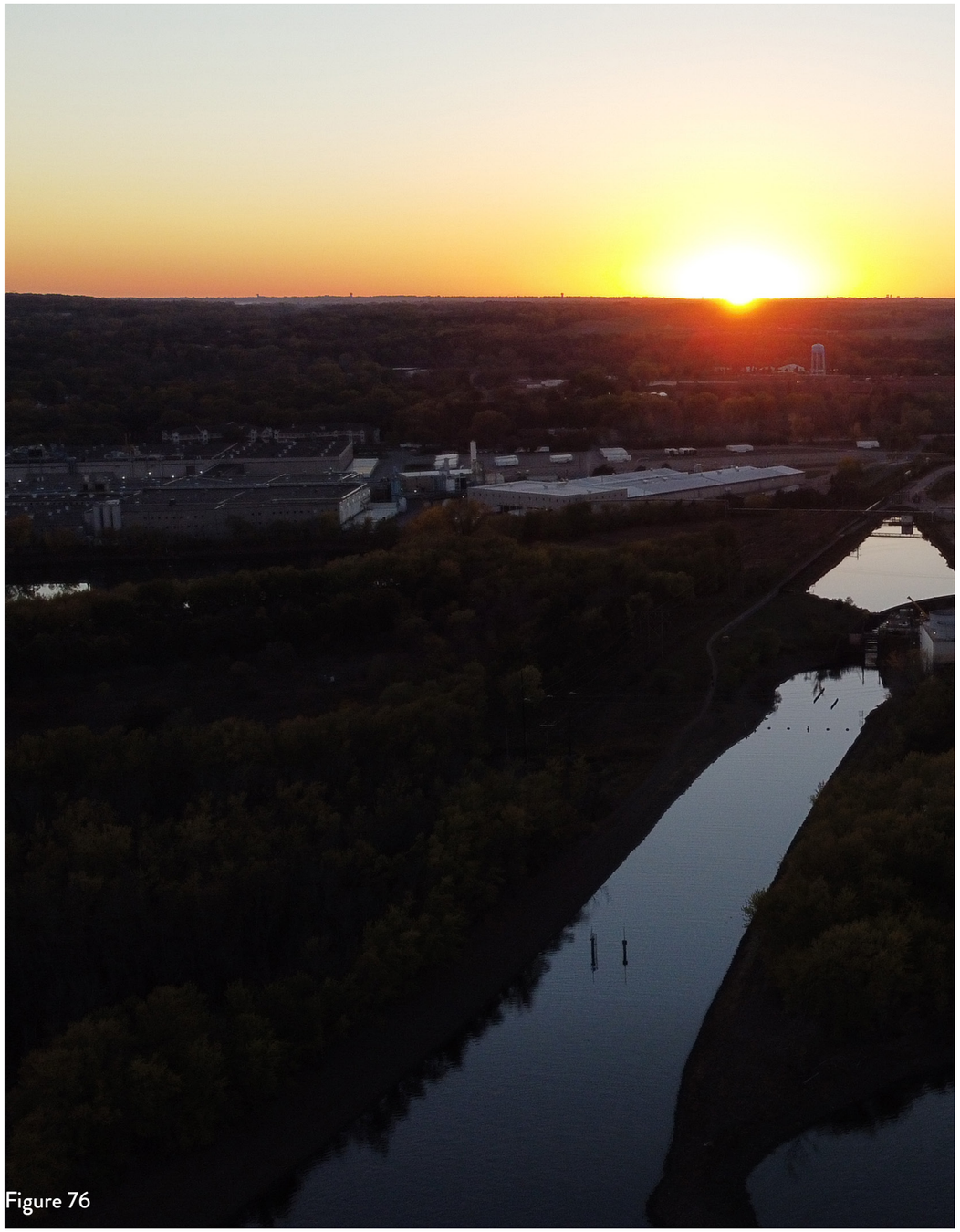
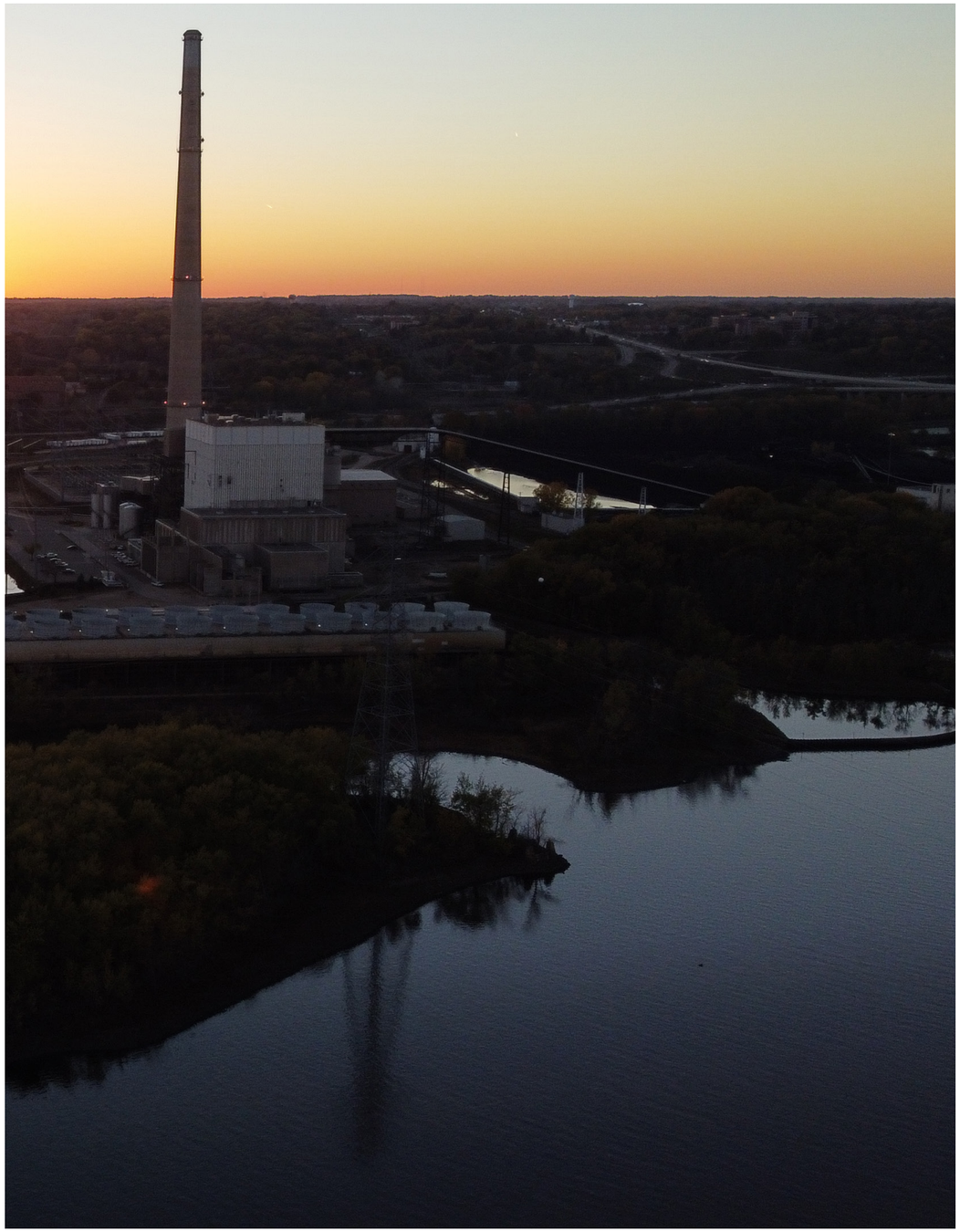


Figure 76

SITE INFORMATION



PERFORMANCE CRITERIA

Energy and Carbon

Energy use and production and carbon emissions are the first criteria for assessing the project. A primary goal for this project is achieving net-zero energy and carbon through on-site energy production and carbon reduced construction/ materials and transportation of materials. Resources from Xcel Energy and Revit will be used to accumulate data on energy production and as a measurement tool. To fully evaluate this project, all buildings throughout the site should be net-zero energy and carbon emissions. The new energy production facility should provide more energy to the grid to the extent of 25% of the former coal plant energy output. Carbon measurement will be theoretical and conceptual with calculations estimated based on materials, transportation, and building systems. LEED, WELL, and Living Building Challenge standards will all be used to grade the project to achieve a net-zero project from LBC, a holistic and comfortable, interaction based design from WELL, and measurable metrics of sustainability and efficiency from LEED.

Figure 77

PERFORMANCE CRITERIA

Space Interaction

Not only will this project include the spaces listing on the next page, these spaces will be integrated together so that they feel like one large space. It should be seamless for users to move between the spaces yet be able to identify that they have moved and should be having different feelings and experiences at this new space. An important aspect of this thesis is the integration and connection of spaces to keep people connected. To accomplish this, multiple design iterations will be completed to determine the best organization. As this is a subjective concept, space interactions will be shown through plans and sections and will be assessed based on the shown connection patterns. These will be shown as overlays over the complete plans and sections to explain how the organization works to be the best solution that accomplishes the project goals. Every designed space will have a fully accessible interaction with nature. This could be >50% undisrupted views of the natural landscape, direct, physical access to the landscape, and/or numerous types of designed and undesigned green spaces.

Adaptive Reuse

This project will employ adaptive reuse studies and case studies to repurpose the existing coal power plant. Other additional buildings will be added to the project where needed, but the existing building will be kept as authentic as possible. In adaptive reuse projects, maintaining the history, character, and form/materiality are important components to be kept to the best of the designer's ability within health and safety code requirements. Before and after comparisons will be shown and used to assess the successful completion of this goal. Comparing the before and after will allow the level of authenticity and character paired with the added or altered elements to be assess based on cohesiveness and hierarchy. No new elements shall overpower the existing history and character of an adaptive reuse project.

PERFORMANCE CRITERIA

Space Allocation Table

Spaces:	Percentage Allocated:
Apartments/Condos	30%
Wellness Center	10%
Athletic Center	5%
Retail	15%
Community Rooms	5%
Energy Production	20%
Mechanical	10%
Service	5%

Space Interaction Matrix

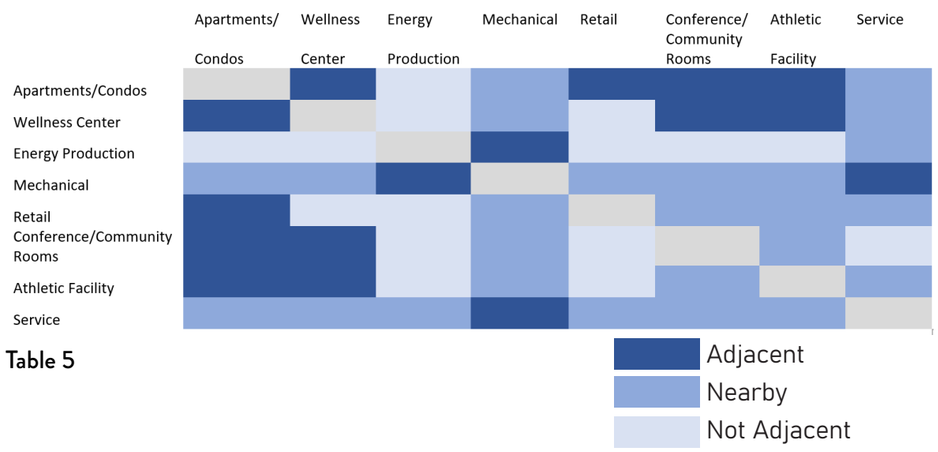


Table 5

PERFORMANCE CRITERIA

Space Allocation Table

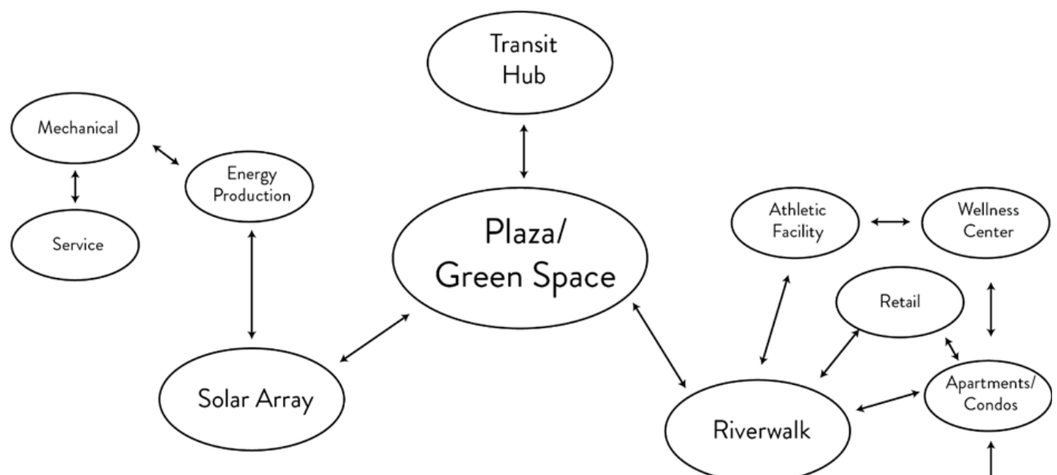


Table 6

All the primary, built spaces will be either be directly connected to each other or indirectly connected via outdoor/public space. Environment and connection to nature is such a major focal point for this project that everything revolves around that, as shown in the space interaction net. Each space will have easy and direct access to all the outdoor spaces included in the project, including but not limited to plazas, parks, river walks, and nature paths. The assessing of spaces is a subjective matter than cannot be easily analyzed. To validate the design and organization of the spaces, iteration analysis will be performed throughout the design in order to confirm the best solution. Simulation softwares will be evaluated to determine viability within the project.

Sustainability and physical connections to nature will be maintained as the primary focal points for analysis within this project. Continuous evaluations and analyses will be conducted throughout the design process to justify design decisions.

APPENDIX

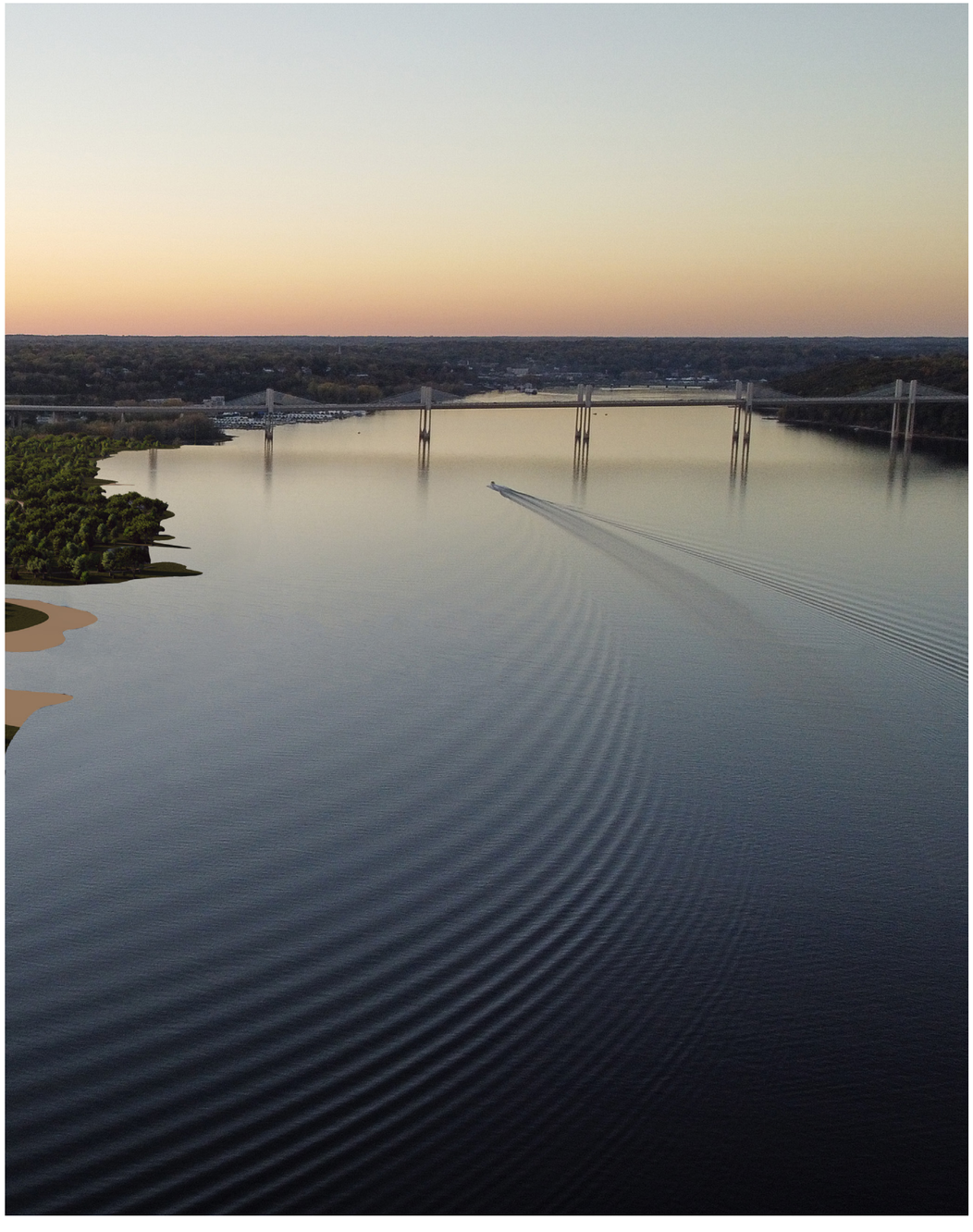
Table 1: Walkability themes and examples of related interventions

Interventions (across) *Themes (down);*	*Infrastructure provision*	*Infrastructure design/quality*	*Pedestrian network*	*Distances*	*Activities supported*	*Programming/policy examples*	*Measures* *Example measures*
Environmental conditions							
Traversable	Paths that are relatively level, even	Basic level	Relatively complete	[a]	Being able to get around at all on foot	[a]	Path presence; basic condition
Compact/ close (destinations, density, layout)	As above	Basic level	Connected, direct paths	Close destinations	Getting to important destinations	High density planning	Distances to destinations; block size
Safe	Separated paths, safe crossings, traffic calming	Pedestrian-scaled lighting, clear sight lines	Safe links/crossings, no movement predictors	[a]	Getting around on food without fear of violence or accidents	Community policing, design for safety, speed limits, limits to pedestrian unfriendly uses (for example abandoned properties)	Safety features (crossings, lighting, good sight lines), perceived and actual crime figures
Physically-enticing	Many paths, street furnishings, landscaping treatments, human scaled building	Many aesthetically pleasing elements	Relatively complete	[a]	Both walking to destinations and recreational walking; excitement	Maintenance/ cleaning; design guidelines, streetscape improvements, public art	Presence of infrastructure elements
Outcomes							
Lively and sociable	Provided	Pedestrian scaled	Relatively complete	Close to substantial residential densities and/or highly accessible by transit /car	Shopping, cultural activities, recreational walking	Activities that bring people out and about	Numbers of people outdoors; people in groups, mapping, traces, interviews
Sustainable transportation option creating	Provided	Basic level	Complete	Close destinations	Walking to destinations; alternative to car	Parking pricing, affordable housing near jobs	Transportation mode split; energy use, transit access by population,
Exercise-inducing	Provided	At least to a basic level	Complete	Close enough (though not too close!)	Both walking to destinations and recreational walking	Social supports, exercise campaigns	Distance walked; total physical activity
Proxies							
Multidimensional	Sidewalks, lighting, street trees and so on	Measurable	Complete, connected	Close destinations	Both walking to destinations and recreational walking	All above.	Multidimensional indicators
Holistic solution	Provided	Many aesthetically pleasing elements	Complete	Close destinations	Both walking to destinations and recreational walking	Pedestrian overlay districts, redevelopment agencies, healthy city programs	Happiness (surveys), redevelopment investment, population increase

[a]Dimension less important in this theme.

DESIGN SOLUTION

Figure 78



Beginnings - Extreme Schemes

Figure 79

Figure 80

Figure 81

Extreme schemes were developed early in the design process to begin thinking of what was possible. The concept for this exercise was to focus heavily on each of the project goals in different schemes. From there, feedback was taken into consideration and the schemes were put against the goals. Ultimately, a combination of schemes 1 and 3 were decided upon for this project and were developed into a full plan that guided the remainder of the project. From scheme 1, the canal system, cutting through existing buildings, and adding new buildings along the canals were the elements kept. It was discovered these strategies supported the goals well of bringing the community together with the canals, connecting site users to nature, and symbolizing history by cutting through the old buildings and bringing new design elements in. Scheme 3 primarily focused on the waterfront development and transformed into building the connection between the built and natural environments. By designing with an intention of integrating the spaces together, people are encouraged to interact with nature more often and find it easier. This exercise helped the design process by initiating elaborate thinking and project intention to design spaces fit for the goals.

Mid-Crit

Figure 82

Original design focues on river interaction and a spaced community.

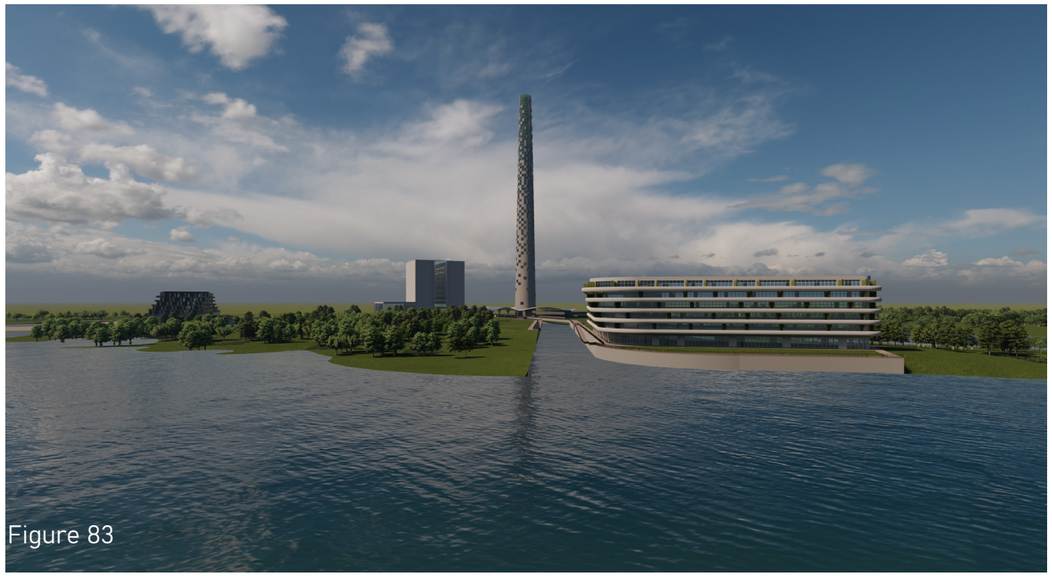


Figure 83

Building design was intended to reflect nautical and organic forms.

Mid-Crit

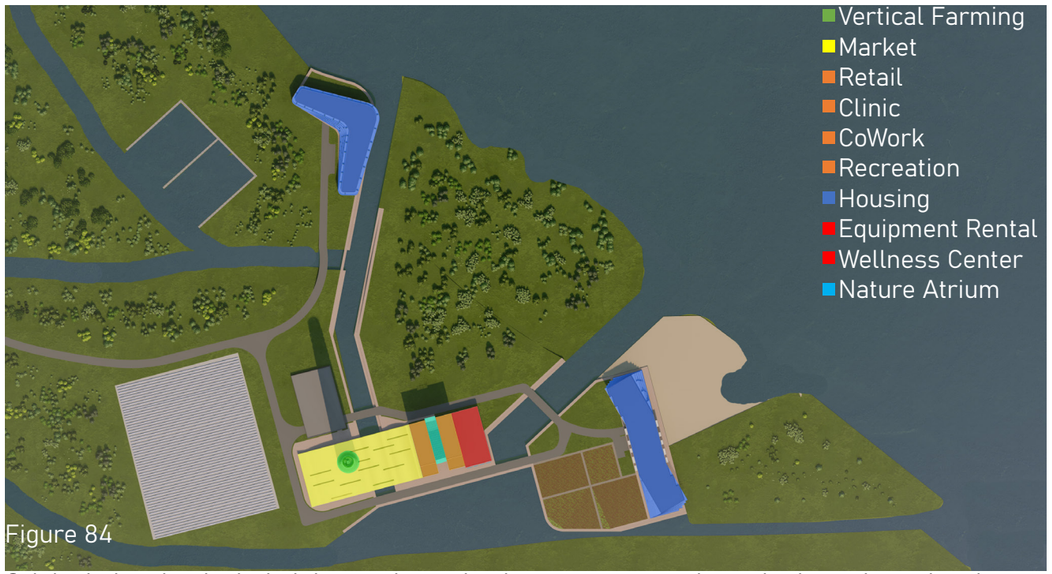


Figure 84

Original site plan included the market, mixed-use spaces, and canals throughout the site.

Figure 85

Edits were made based on feedback to create a denser community and accomplish goals.

Site View Sketches

Figure 86

Site plan sketches were created to design the natural spaces.

Figure 87

Trails were created to be natural through the foliage.

Atrium

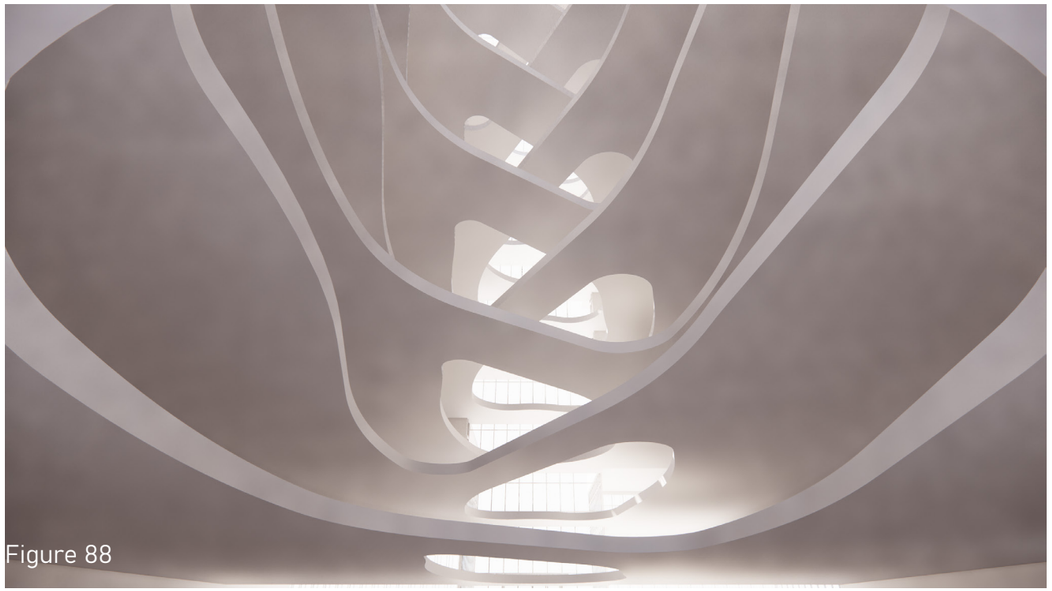


Figure 88

Figure 89

Atrium design concepts focused on nature interaction and connectivity of spaces.

Atrium

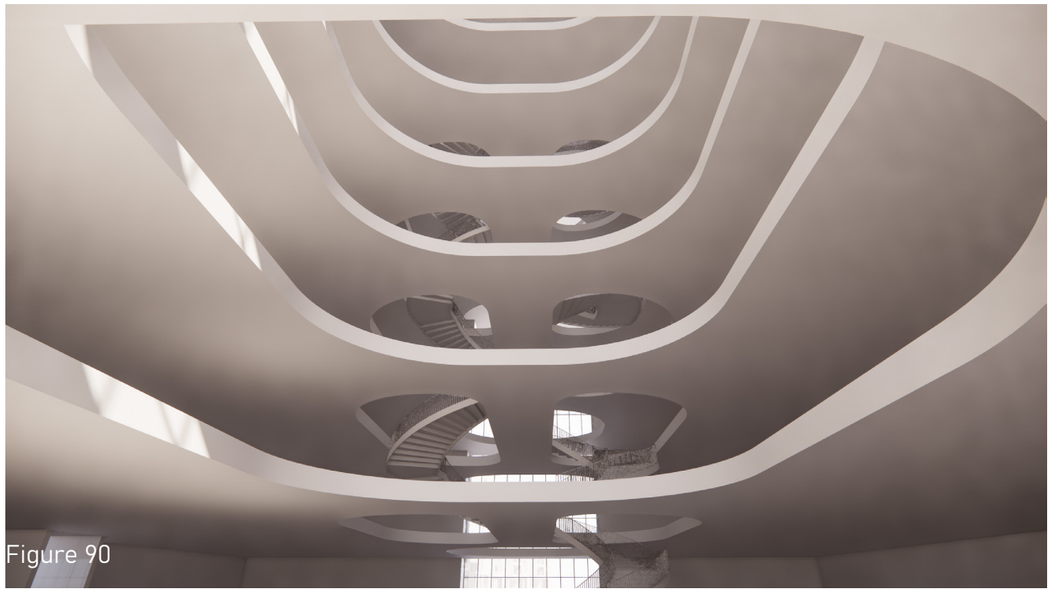


Figure 90

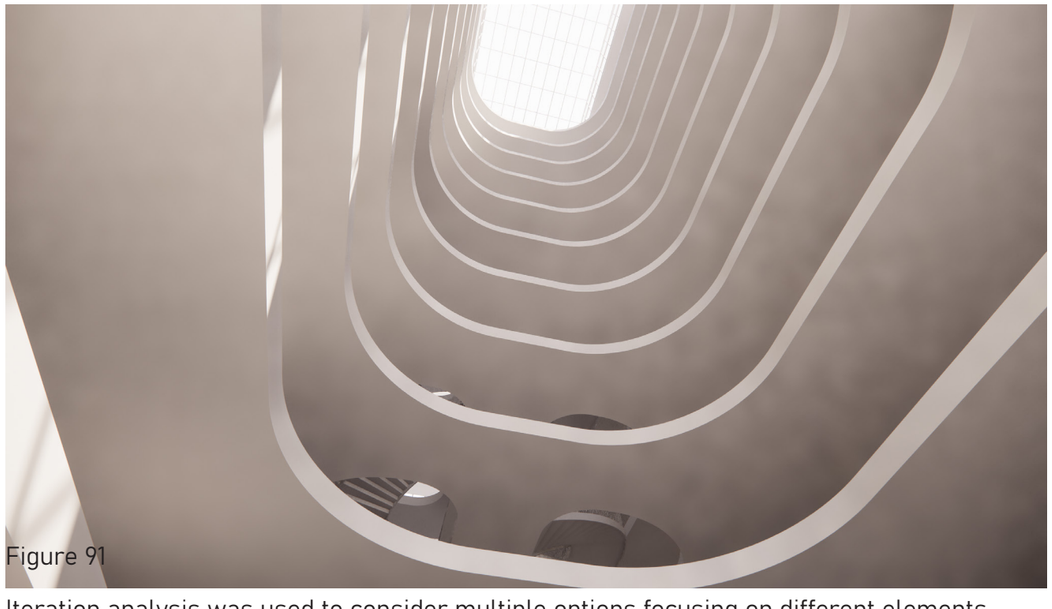


Figure 91

Iteration analysis was used to consider multiple options focusing on different elements.

Sketches

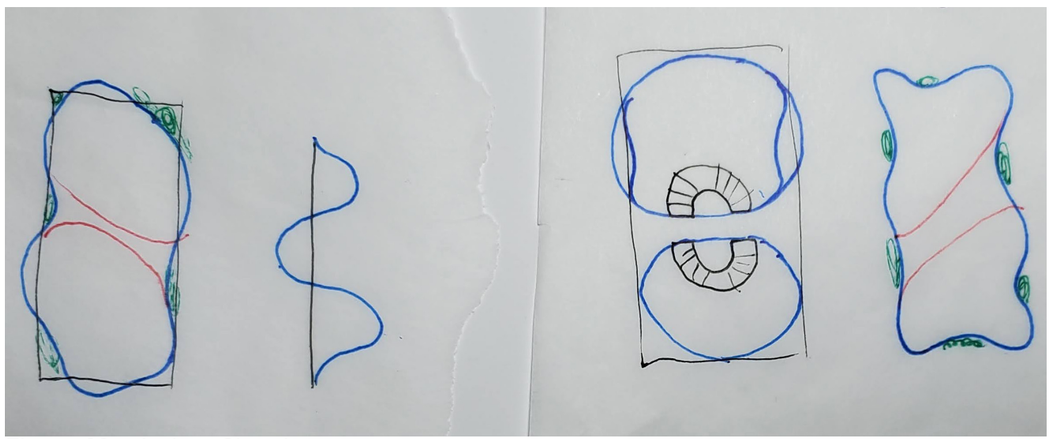


Figure 92 - Atrium Sketches

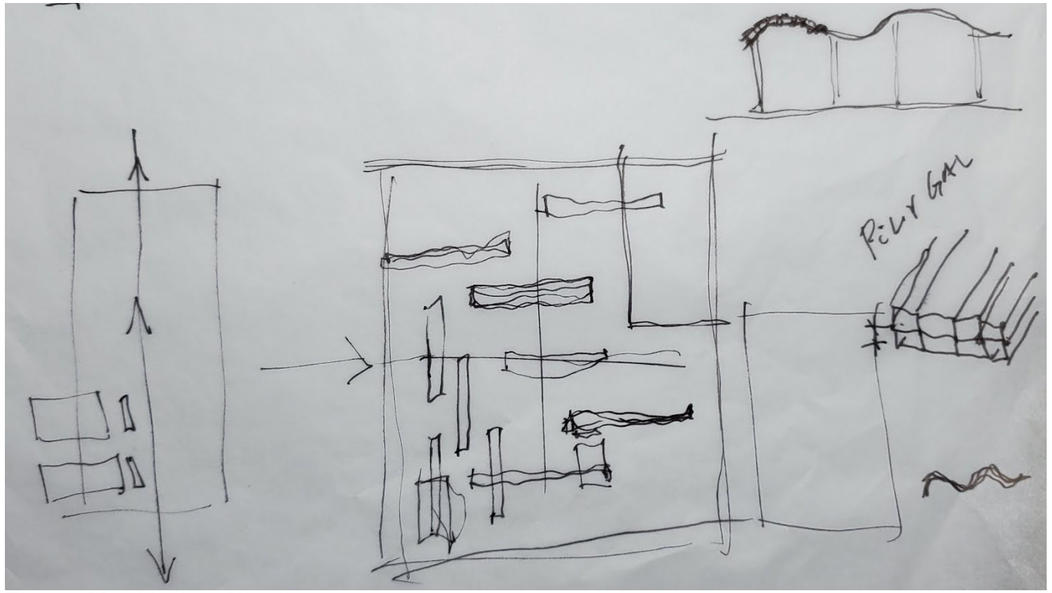


Figure 93 - Market Sketches

Atrium and Market designs originated from numerous sketches to determine possibilities.

Board Planning and Lists

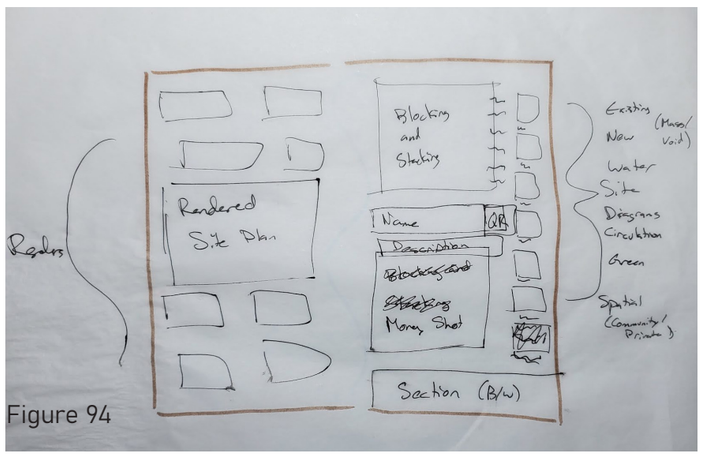
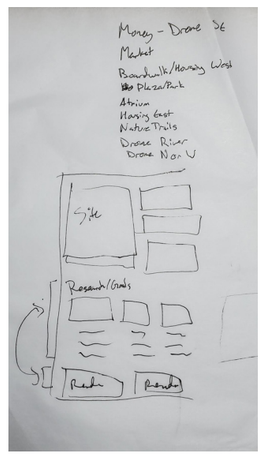


Figure 94



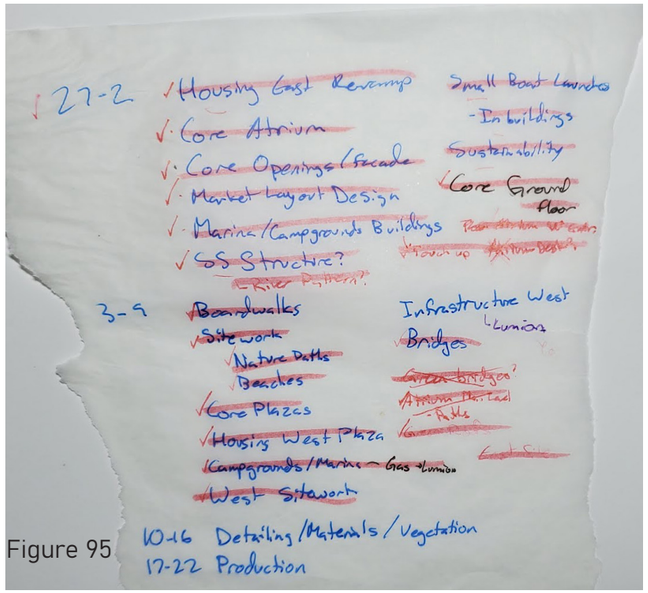


Figure 95

Multiple final board layouts were tested and considered. Lists were used heavily throughout.

Figure 96

Creating a dense community allows for interaction and stronger community and culture.

Figure 97

Returning a majority of the site to its natural environment continues the national scenic river.

Figure 98

Canals connect the community to the rest of the natural site and renewable energy is added.

Figure 99

Canals are developed from the natural water filled and low areas for a smooth transition.

FINAL DESIGN

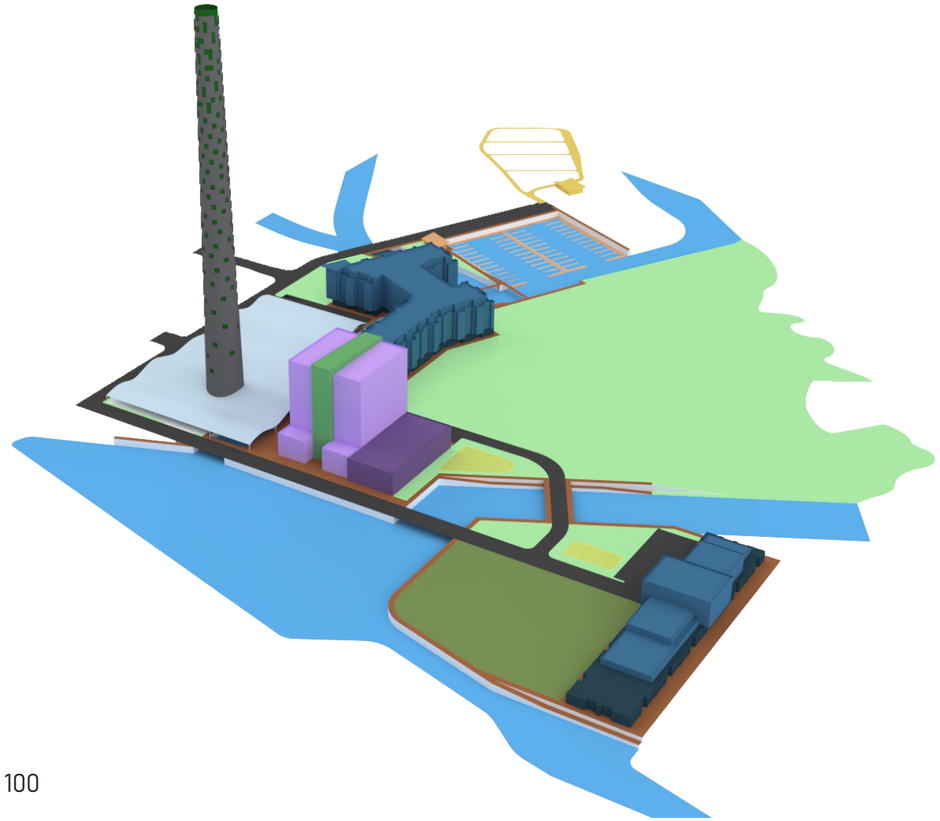


Figure 100

- Green Space
- Canals
- Boardwalks
- Playground
- Housing
- Farmers Market
- Smokestack/Vertical Farming
- Marina
- Campgrounds
- Commercial
- Nature Atrium
- Wellness

FINAL DESIGN

Figure 101

- Green Space
- Canals
- Retail
- Farmers Market
- Community Garden
- Smokestack/Vertical Farming
- Marina
- Campgrounds
- Commercial
- Nature Atrium
- Wellness
- Vehicular Circulation
- Primary Pedestrian Circulation
- Secondary Pedestrian Circulation

FINAL DESIGN

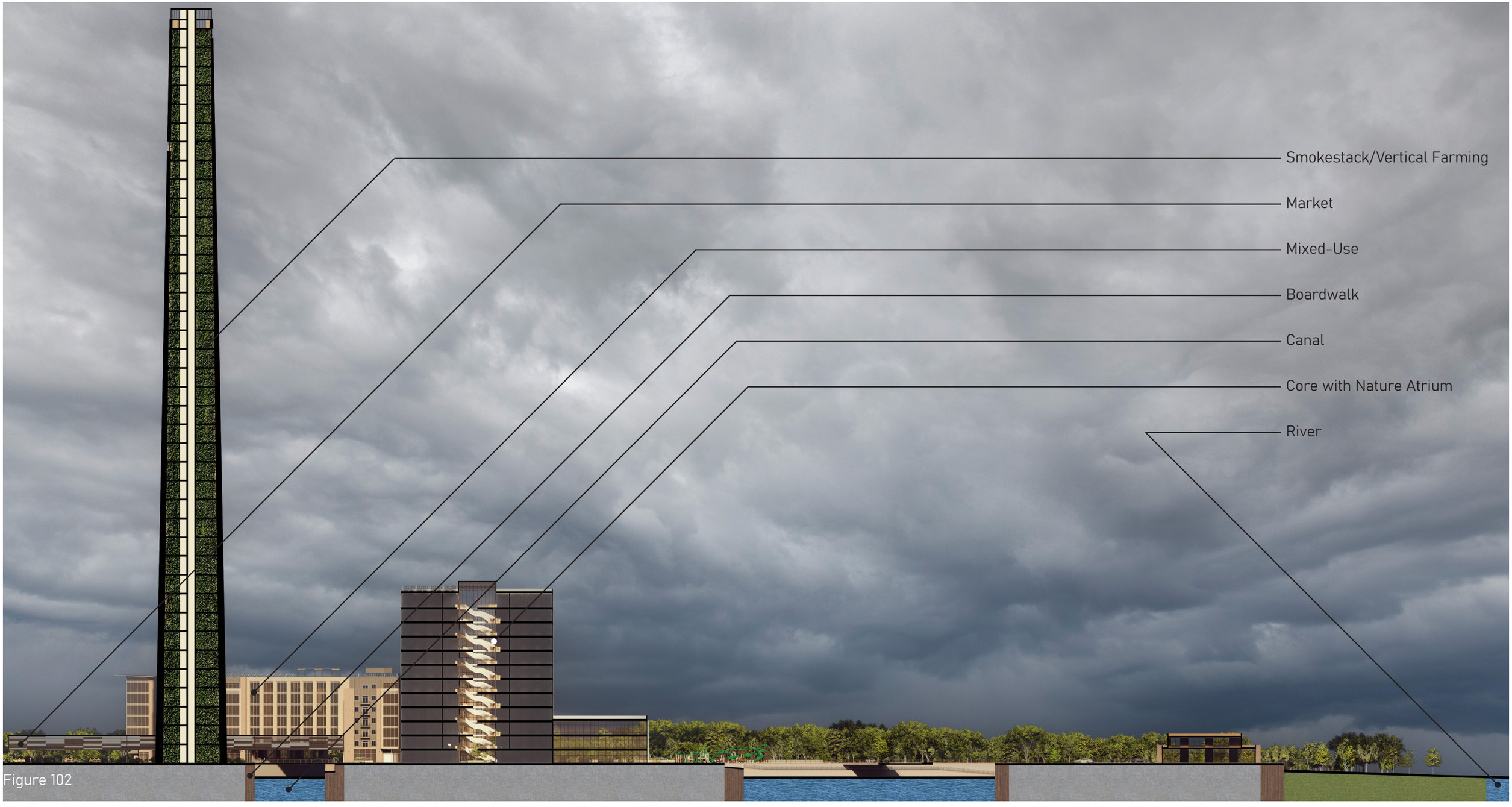


Figure 102

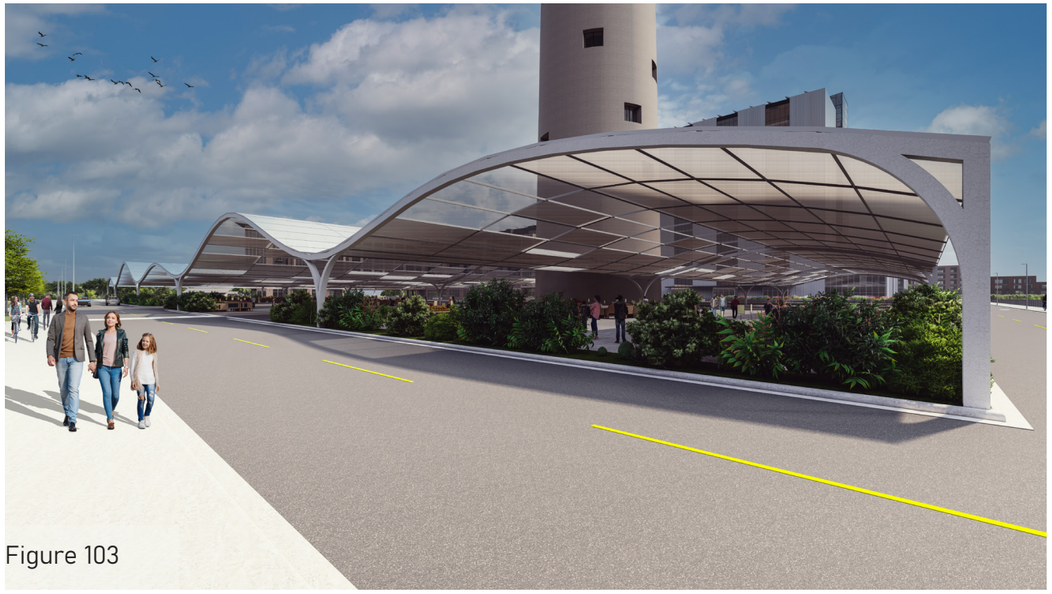


Figure 103

Open air market, inspired by the flowing river, allows for flexible use of space year-round.

Figure 104

Boardwalks line the canals with mixed-use buildings to activate the ground level.

Figure 105

Nature atrium brings nature in and allows interaction with nature at any time.

Figure 106

Plaza provides numerous nature experiences directly adjacent to all the mixed-use.

Figure 107

Repurposed core brings natural light in with expansive glazing with views to the canals.

Figure 108

River interaction with the site remains important year-round with the smokestack landmark.

Figure 109

Boardwalks easily connect the market, core, and other mixed-use spaces seamlessly.

Figure 110

Removing small portions of the smokestack allow the vertical farming to be visible outside.

PERFORMANCE ANALYSIS

Response to the Site and Context

Site reclamation of the polluting coal field and returning the area to its natural environment is the primary site response. Restoring natural habitats was an important element of the design and providing these areas of nature to the entire community. Retaining existing buildings helps to reduce the impact of site disturbance. The shoreline is left unbuilt to retain the national scenic riverway beauty. Canals are introduced around the site based on what parts already flood or are low points to promote the movement around the site.

Repurposing a coal plant and smokestack into healthy, vegetated spaces for the public responds to the context of the energy shift in the country and symbolizes positive change. Mixed-use buildings and communities are also growing in popularity and need. Designing mixed-use spaces allows for flexibility and change within the needs of the users and allows the buildings to be sustainable for long term use.

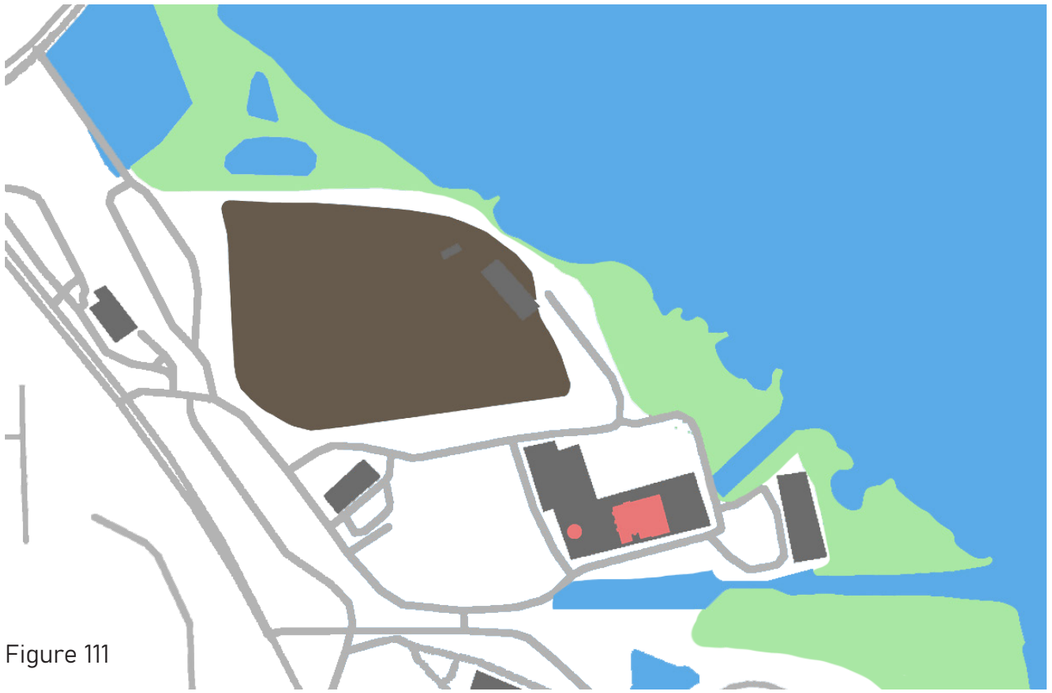


Figure 111

PERFORMANCE ANALYSIS

Response to the Research

This thesis evolved into a community mixed-use masterplan. Precedent studies were completed on community masterplans, repurposed coal power plants, and vertical farming projects. These studies informed the designs of the buildings and the overall masterplan and organization of spaces. Beloit College Powerhouse provided a strong example of how a coal power plant can be repurposed to revitalize a community, as found in the article “Repurposed Coal Plant Sites Empower and Revive Communities.” Southgate Masterplan explained how a full mixed-use community, designed around the person, can build a community and encourage interaction. As a result of these case studies, the community mixed-use masterplan, based around a repurposed coal plant, was created with the intention of achieving the project goals. This thesis project successfully accomplished its intention and goals based on the typological precedent studies on repurposed coal plants and community masterplans.

Figure 112

PERFORMANCE ANALYSIS

Response to the Goals - Connection to Nature

Humans are inherently a piece of nature and interaction with nature is crucial to a healthy community. Site remediation to return the environment to its natural state allows for nature to grow back and interact with humans. Canals are introduced to the site to provide easier and safer access to the river while also serving as connections across the site. Interactive boardwalks line the canals throughout the community core to connect users to the river. “Undesigned” natural spaces and trails connect the different areas of the natural landscape to the community core and encourages site users to interact with the nature around them. A plaza style park is designed to serve as the transition space from built to natural environment. Varying experiences throughout the park accommodate the needs of any user. Creating a variety of landscapes connecting users to the natural environment encourages humans to intentionally interact with nature consistently to experience the health benefits it has to offer. Nature is introduced into the buildings to emphasize living in harmony with built and natural environments. Bringing nature in allows more opportunities to interact with nature as well as year-round connections.

Figure 113

PERFORMANCE ANALYSIS

Response to the Goals - History and Symbolism

Serving as a landmark for decades, the smokestack is an integral part of the community. While primarily negative, preserving and repurposing the smokestack symbolizes society’s rapid shift to cleaner and more sustainable practices. Air and water pollution and wasteful tendencies have plagued society for decades, significantly affecting the health and well-being of communities. Rather than ignoring and hiding the past, showcasing it provides a learning opportunity. Having an 800 foot tall smokestack is a unique community attribute. Embracing the heavy, vertical element into modern design symbolizes the change society is continuously going through. Vertical farming becomes the primary use of the smokestack, utilizing water fertilized by fish waste and quickly recycled into the river. Adjacent to the smokestack, the powerhouse core is just as brutal in the sky. Originally where the primary power generation occurred, now serves as the community core. While repurposed, the core design is inspired from the past of having a strong central core to build around. Retaining the major historical elements from the existing site builds the community culture and provides a focal point for the community to learn and grow together.

Figure 114

PERFORMANCE ANALYSIS

Response to the Goals - Community

Human life has been built around community since the beginning of time. Communities provide endless benefits and resources of safety, support, and economic stability. Typically, communities are built around a central focus or core. These projects provide an economic boom, cultural strength, and health benefits. The repurposed core encourages interaction between all types of people with its many uses. Building a community around the hub continues the ideal of interaction based design. New ideas are birthed from and productivity increases from human to human interaction in everyday life. Random interactions also provide an introduction to different life perspectives and experiences through peer education. One of the biggest issues with community design is exclusivity. With great opportunities along the riverfront, this project is intended to be used by everybody including residents, surrounding communities, and travelers passing through. Easy access to all amenities encourages new users to visit and interact with new people. Repurposing decaying power plants benefits their communities through economic increases. With numerous public funding options, communities are able to feel a direct impact by the ability to complete these ambitious projects regardless of their economic status.

Figure 115

PERFORMANCE ANALYSIS

Response to the Goals - Sustainability

Preservation is inherently green. Repurposing old buildings and designing new buildings on previously developed land are among the most sustainable design strategies. Reduced carbon footprint, material waste, transportation, and site disturbance are the major benefits of repurposing or renovating old buildings. Removal of pollution sources and site remediation results in a healthier and longer lasting landscape allowing future generations to experience the same healthy lifestyles. Renewable energy sources are included in the design to assist in reaching the AIA 2030 commitment as well as reducing pollution. Vertical farming in the smokestack uses only recycled river water fertilized by fish waste resulting in no waste to grow thousands of pounds of food each year. Sustainable design goes further than energy efficiency. Many buildings are not designed to last 50+ years and result in frequent material waste from demolition and new construction. Society and its needs are continuously changing and require more flexibility in building design to accommodate changes in space needs. Planning for spaces to be changed reduces the need for renovation and new construction. All buildings in this project are mixed-use spaces ready to accommodate any variety of uses while maintaining the community connections.

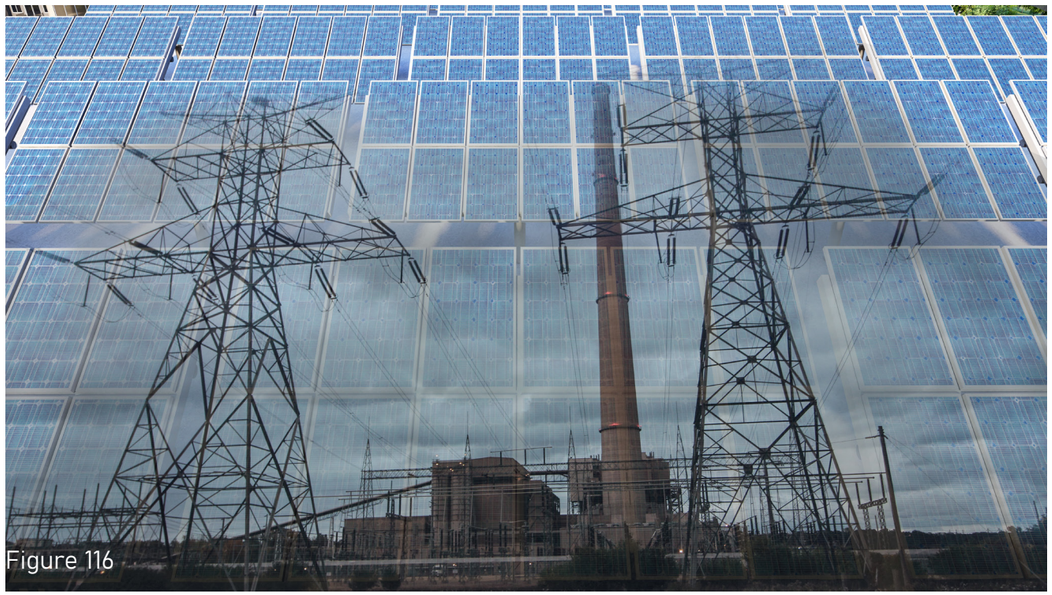
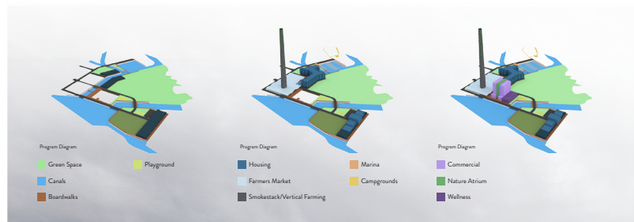


Figure 116

CHANGING AND ADAPTING

Integrating nature with the built environment in a coal power plant redevelopment and reclamation project to improve health, wellbeing, and happiness.



Sustainable architecture has become the standard in recent years in an effort to protect our environment. Along with this design methodology shift, energy production is becoming greener and cleaner, moving away from coal and other polluting and economically unstable energy sources. Left behind from these changes are decaying power plants and contaminated sites in otherwise beautiful locations. Coincidingly, cities and developers are tearing up greenfields, farms, and natural habitats to mass-produce single-family housing. Redevelopment of tattered industrial zones and brownfields provides a much more sustainable model to grow communities, retain open space and practice environmental reclamation.

Addressing these practices, the redevelopment of a closing coal power plant along the banks of the St. Croix National Scenic Riverway to create a sustainable, healthy, and holistic community integrated with nature, serves as the design response for this thesis project. Integrating living communities with natural landscapes provides numerous health and happiness benefits as well. Restoring the disturbed and polluted landscape and repurposing the smokestack become the drivers for the project in creating a community designed for human interaction with nature.

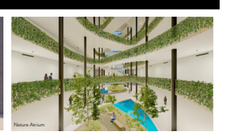
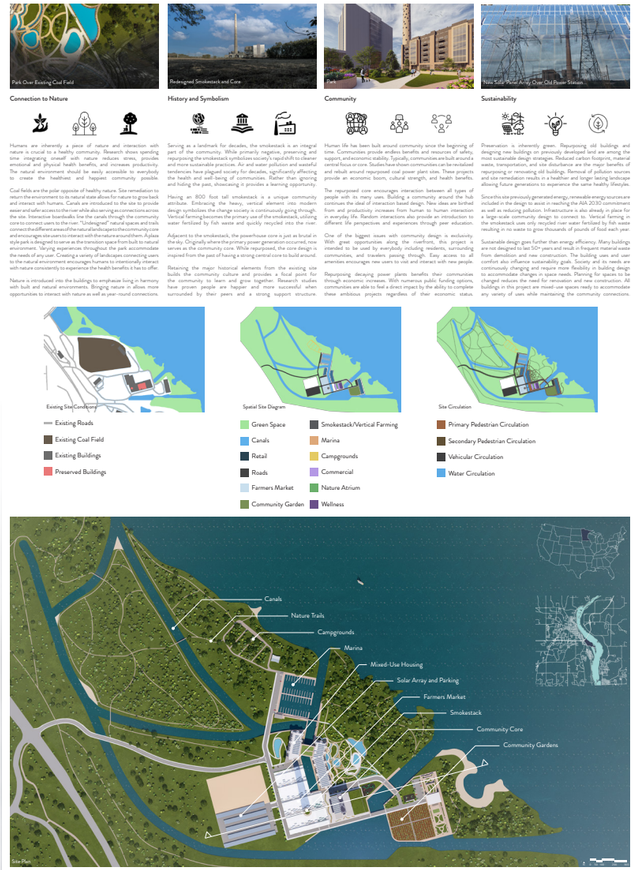


Figure 117



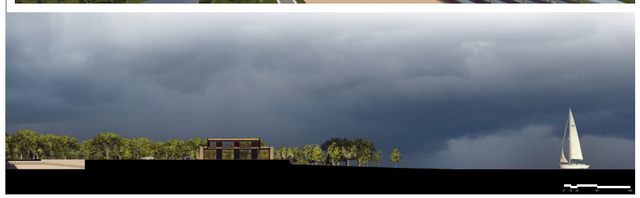


Figure 118

INTRODUCTION

INTEGRATING NATURE WITH THE BUILT ENVIRONMENT IN A COAL POWER PLANT REDEVELOPMENT AND RECLAMATION PROJECT TO IMPROVE HEALTH, WELLBEING , AND HAPPINESS.

PRESENTATION SLIDES

PROJECT GOALS

CONNECTION TO NATURE

HISTORY AND SYMBOLISM

COMMUNITY

SUSTAINABILITY

HISTORY AND SOCIAL CONTEXT

1882

2007

1968

2017

1993

2020

2006

2028

PRESENTATION SLIDES

RESEARCH - NATURE

HUMANS ARE INHERENTLY A PIECE OF NATURE

GREEN SPACES REDUCE STRESS IN CITY RESIDENTS

NATURE SHOULD BE EASILY ACCESSIBLE

COMMUNITIES FOCUSED AROUND NATURE ARE MORE VIBRANT

“HUMAN HEALTH AND WELLBEING DEPENDS ON NOT ONLY GENETICS BUT ALSO THE CONDITIONS OF LIFE.”

RESEARCH - HISTORY/SYMBOLISM

COAL PLANT BUILDINGS ARE UNIQUE IN THEIR DESIGN

HISTORY CAN BE RESPECTED AND CELEBRATED YET MOVED ON FROM

POWER PLANTS WERE OFTEN THE START OF A NEW CITY

REPURPOSED COAL PLANTS SYMBOLIZE SOCIETY’S EVOLUTION

“THE FATE OF RETIRED POWER PLANTS CAN ALSO DETERMINE THE FUTURE OF NEIGHBORHOODS.”

PRESENTATION SLIDES

RESEARCH - COMMUNITY

REPURPOSING COAL PLANTS REVITALIZES COMMUNITIES

COMMUNITIES TAKE PRIDE IN THESE BUILDINGS

COMMUNITIES ARE BEST FORMED AROUND LANDMARKS

USER FOCUSED COMMUNITIES BUILDS CULTURE

RESEARCH - SUSTAINABILITY

SUSTAINABILITY MEANS MUCH MORE THAN ENERGY EFFICIENCY

USING EXISTING BUILDINGS IN MORE SUSTAINABLE THAN NEW BUILDS

DENSE COMMUNITIES SIGNIFICANTLY REDUCE CARBON EMISSIONS

INFRASTRUCTURE IN PLACE ON-SITE FOR ENERGY INPUT AND OUTPUT

PRESENTATION SLIDES

PROJECT SITE

OAK PARK HEIGHTS, MINNESOTA

XCEL ENERGY ALLEN S. KING COAL POWER PLANT

BORDERED BY ST. CROIX RIVER, HWY 36 AND 95

SITE RESEARCH

MINIMAL PUBLIC ACCESS TO SITE

COAL COVERS LARGE PORTION OF SITE

MAJOR INCREASE IN VEHICULAR TRAFFIC

CLOSE PROXIMITY TO ST. CROIX LOOP TRAIL

MOST BUILDINGS IN DISARRAY

STRONG VIEWS IN TO AND OUT FROM THE SITE

PRESENTATION SLIDES

SITE RESEARCH

YEARLY RIVER FLOOD

RIVER IS HAZARDOUS ALONG SITE

POLLINATOR HABITAT MAINTAINED ON-SITE

RIVER USED HEAVILY FOR RECREATION AND TRAVEL

NUMEROUS PEACEFUL AND QUIET AREAS ON-SITE

SMALL NEIGHBORHOOD ON PENINSULA TO THE SOUTH

DESIGN

PRESENTATION SLIDES

PATTERN LANGUAGE - PROGRAM

MIXED-USE

GROUND LEVEL ACTIVATION

AFFORDABLE HOUSING

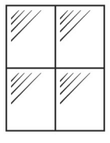
WALKABILITY

PATTERN LANGUAGE - MATERIALITY

RETAIN ORIGINAL MATERIALS

WARM, EARTH TONES

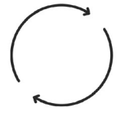
BRICK AND WOOD



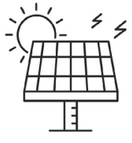
GLAZING

PRESENTATION SLIDES

PATTERN LANGUAGE - SUSTAINABILITY

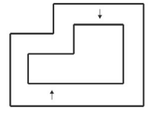


DESIGN FOR THE LONG-TERM

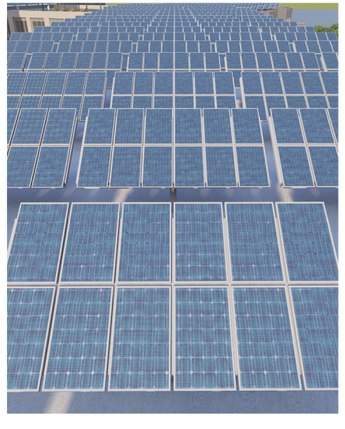


RENEWABLE ENERGY ON-SITE

NATIVE VEGETATION

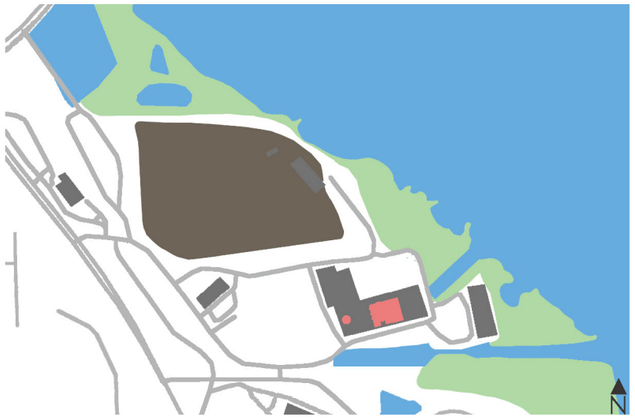


REDUCE BUILDING FOOTPRINT



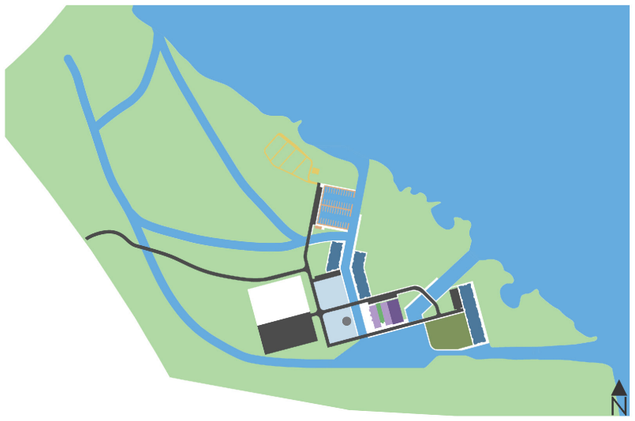
PRESENTATION SLIDES

SITE DIAGRAM - EXISTING



- Existing Roads
- Existing Coal Field
- Existing Buildings
- Preserved Buildings

SITE DIAGRAM - NEW



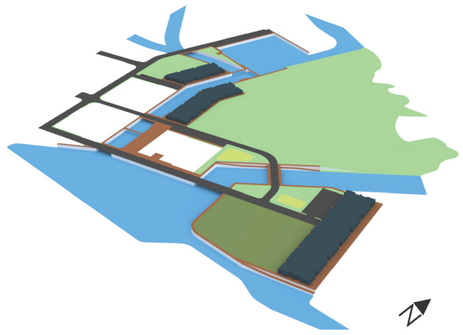
- Green Space
- Canals
- Retail
- Farmers Market
- Community Garden
- Smokestack/Vertical Farming
- Marina
- Campgrounds
- Commercial
- Nature Atrium
- Wellness

PRESENTATION SLIDES

SITE DIAGRAM - CIRCULATION

- Vehicular Circulation
- Water Circulation
- Primary Pedestrian Circulation
- Secondary Pedestrian Circulation

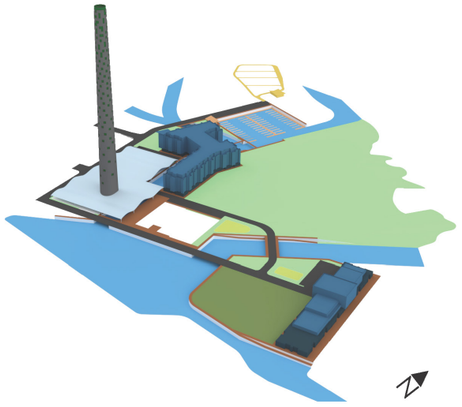
PROGRAM DIAGRAM



- Green Space
- Canals
- Boardwalks
- Playground

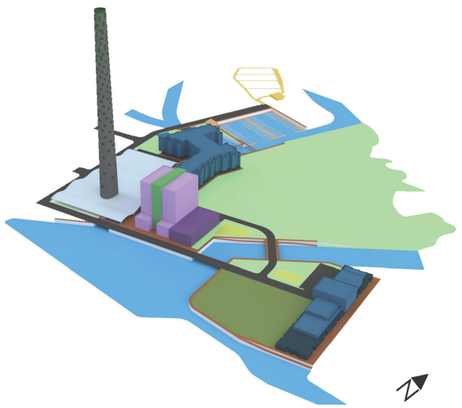
PRESENTATION SLIDES

PROGRAM DIAGRAM



- Housing
- Farmers Market
- Smokestack/Vertical Farming
- Marina
- Campgrounds

PROGRAM DIAGRAM



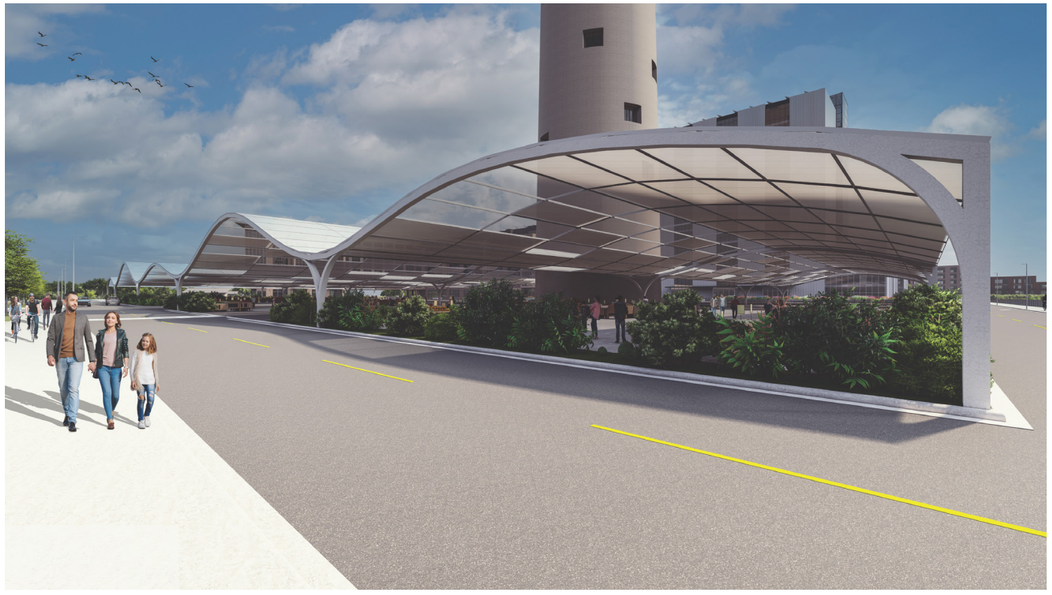
- Commercial
- Nature Atrium
- Wellness

PRESENTATION SLIDES

PRESENTATION SLIDES

PRESENTATION SLIDES

PRESENTATION SLIDES



PRESENTATION SLIDES

PRESENTATION SLIDES

GOALS - CONNECTION TO NATURE

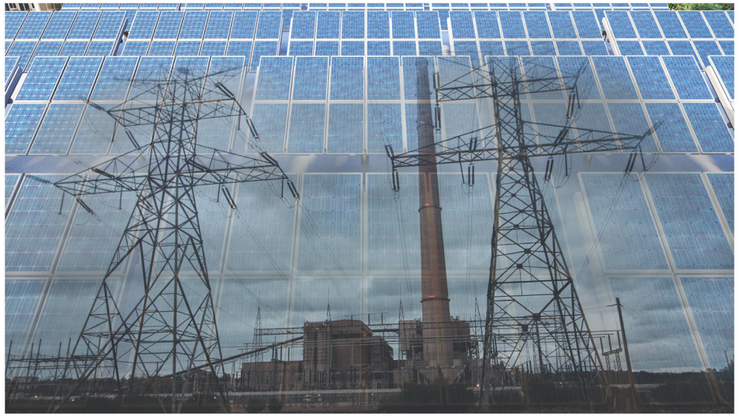
PRESENTATION SLIDES

GOALS - HISTORY AND SYMBOLISM

GOALS - COMMUNITY

PRESENTATION SLIDES

GOALS - SUSTAINABILITY



PRESENTATION SLIDES

PROJECT INSTALLATION

Figure 119

PROJECT PRESENTATION

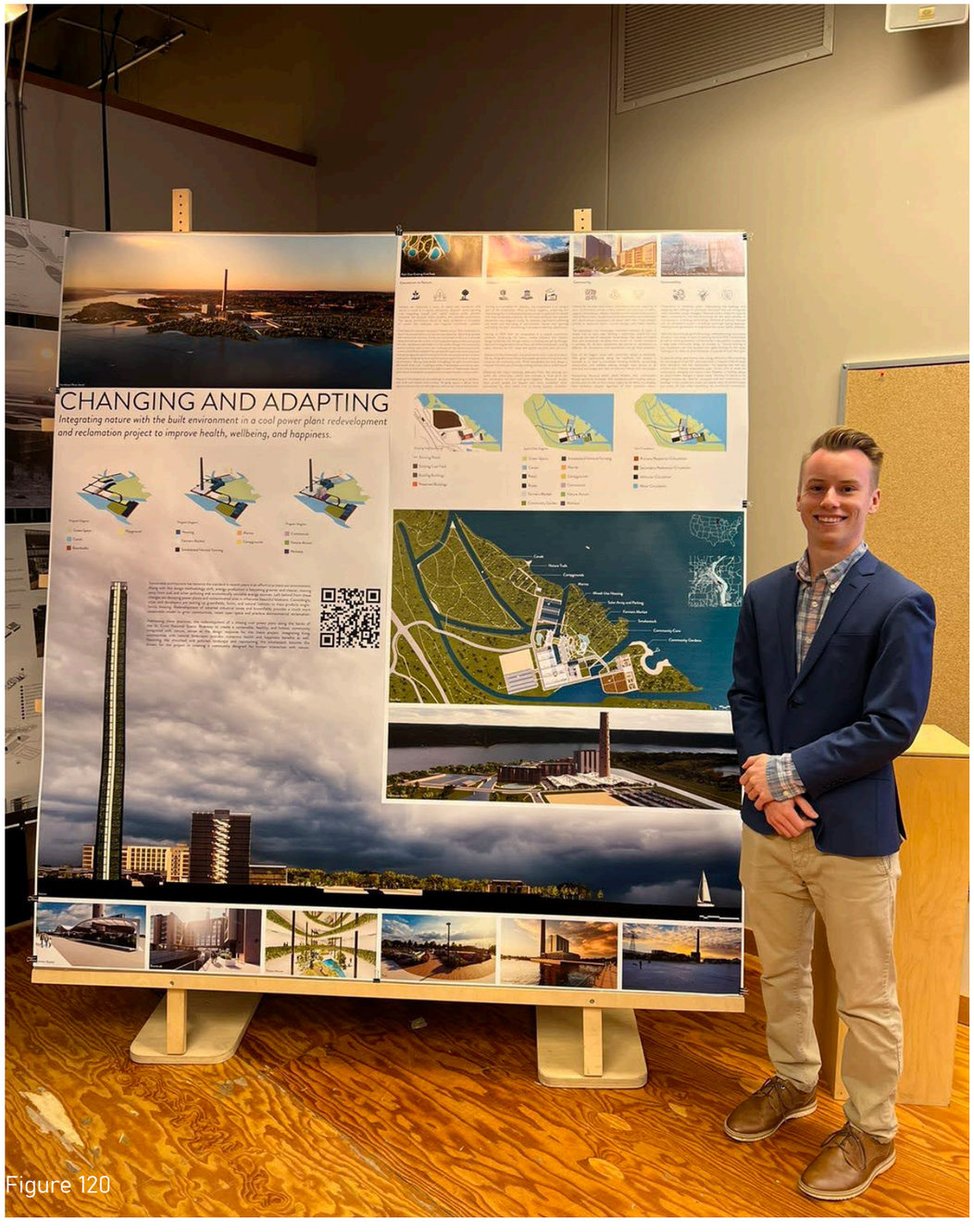


Figure 120

Figure 121

Figure 122

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DESIGN STUDIO EXPERIENCE

2nd Year

Fall: Cindy Urness
Breathing Room - Moorhead, MN
Boathouse - Jamestown, ND

Spring: Charlott Greub
Small Dwelling - *Dwell in the Sky* - Marfa, TX
Multi-Family Housing - *Moor on Main* - Moorhead, MN

3rd Year

Fall: Paul Gleye
Visitors' Center - Fargo, ND
Mixed-Use Student Center - Fargo, ND

Spring: Bakr Aly Ahmed
Futuristic Residence - *Wave Residence* - Moorhead, MN
Office Building - *Angle* - Bismarck, ND *

4th Year

Fall: Amar Hussein
Capstone High Rise - *Echo* - Miami, FL

Spring: David Crutchfield
Marvin Windows House Competition - *1529* - Fargo, ND **
Urban Design - *The District* - Fargo, ND

5th Year

Fall: Lance Josal
Empire Builder Urban Infill - *Empire* - Fargo, ND

Spring: Jennifer Brandel
Design Thesis - *Changing and Adapting* - Oak Park Heights, MN

* - Competition Students' Choice Award
** - Competition Finalist