Resilient Urbanism: Bridging Natural Elements & Sustainable Structures in a Post-Industrial Urban Environment

Nicholas McGee

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RESILIENT URBANISM: BRIDGING NATURAL ELEMENTS & SUSTAINABLE STRUCTURES IN A POST-INDUSTRIAL URBAN ENVIRONMENT

A Thesis Presented

by

NICHOLAS R. McGEE

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

MASTER OF ARCHITECTURE

May 2020

Department of Architecture
RESILIENT URBANISM: BRIDGING NATURAL ELEMENTS & SUSTAINABLE STRUCTURES IN A POST-INDUSTRIAL URBAN ENVIRONMENT

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Approved as to style and content by:

_____________________________
Stephen Schreiber, Chair

_____________________________
Emily Wright, Member

_____________________________
Stephen Schreiber, Department Chair
Department of Architecture
DEDICATION

This thesis is dedicated to the People of Hartford, Connecticut.

“Of all the beautiful towns, it has been my fortune to see [Hartford] is The Chief.”
– Mark Twain
ACKNOWLEDGMENTS

First and foremost, I would like to thank the faculty and staff of the Integrated Design Building and the Department of Architecture for furthering my education these past two years. My education, and more importantly my thesis, would be incomplete without the guidance and nurturing of Stephen Schreiber, Kathleen Lugosh, and Emily Wright, and for this, I owe them my unending gratitude.

Next, I owe thanks to my parents, whose encouragement and pride has pushed me to live up to the hype all three of them have set for me. And to all six of my siblings, I am grateful for our endless shenanigans to get me through these two long years. And of course, to the rest of my extend family for their constant support.

Lastly, to my friends and classmates in the Architecture Department, I owe a debt of gratitude for everything, from teaching me (and reteaching me) the laser cutter settings to our individual desk critique sessions, and for putting up with my countless lectures on the City of Hartford. And to my friends outside of the UMass system, who may not understand why anyone would want to continue with architecture school, but for supporting my decision and my progress, nonetheless.

Special thanks are also required for my coworkers at Jones Whitsett Architects for their constant understanding, assistance, support, and encouragement, and for constantly reminding me to go work on my thesis.
ABSTRACT

RESILIENT URBANISM: BRIDGING NATURAL ELEMENTS & SUSTAINABLE STRUCTURES IN A POST-INDUSTRIAL URBAN ENVIRONMENT

MAY 2020

NICHOLAS R. McGEE, B.S.ARCH, WENTWORTH INSTITUTE OF TECHNOLOGY
M.ARCH., UNIVERSITY OF MASSACHUSETTS AMHERST

Directed by: Professor Stephen Schreiber

How can the revival of nature combined with the introduction of contemporary structures improve a city’s appeal? The goals of this thesis are as follows: 1) To provide a new public space along Hartford’s waterfront, 2) To relieve traffic of those traveling through Hartford, 3) To allow for easier/increased access for local traffic to access the downtown area and central business district, and 4) To create connections across the River at the Human Scale. The relocation of I-91 to the opposite side of the Connecticut River using existing infrastructure is a clean, concise way of achieving these four goals. By having I-91 cross the Connecticut River south of downtown on the existing Charter Oak Bridge, following the Right-of-Way of the current State Route 2, intersecting with Interstate 84 at a four-way, all-access intersection, and traveling back across the Connecticut River north of downtown using an existing Right-of-Way, the Riverfront opens up while allowing for easier traffic flow for both local and through traffic. A new boulevard in the existing highway’s Right-of-Way that starts and ends at exits off of the new configuration of I-91 allows for local traffic to access all parts of downtown, while having through traffic avoid the commuters and bypass the city completely. The new intersection of I-91 and I-84 across the River in East Hartford would allow all users access to all points, no matter what direction they're traveling; something the current intersection in downtown does not offer. Using existing bridges and Rights-of-Way also does the least amount of damage to current residents of East Hartford and its own waterfront, as there would be no new land needed for this new configuration. The following thesis attempts to bring life back into the downtown area of Hartford, Connecticut through various means that have been proven to work well in other cities throughout the United States.
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CHAPTER 1

INTRODUCTION

Through the years, Hartford has seen its share of ups and downs. However, it seems as if the City is finally headed in a positive direction for a more sustainable future after a long, slow decline. The main purpose of this thesis is to help that direction along and solidify the City of Hartford as a United States metropolis once again. This is achieved through a thorough, two-part process. Through the research conducted in this thesis, it was determined that implementing green infrastructure, affordable housing, and community services to a part of Downtown Hartford that has been empty for too long is the kickstarter on a much larger campaign to make the City of Hartford more sustainable. These implementations effect Hartford’s Triple Bottom Line of Planet, People, Profit. By improving and sustaining Hartford’s natural landscapes, gathering its citizens for social interaction, and stimulating the city’s economy, Hartford can become a self-sustained city and regional hub.

The first half of this thesis project enacts a Master Plan for the City of Hartford’s Waterfront. This Master Plan relocates and removes certain sections of highway along the banks of The Connecticut River in Downtown Hartford and makes way for new development and access of a more vibrant Riverfront Park. This Master Plan also releases the Park River from its previously buried state, allowing for green development along this corridor from the Riverfront through downtown. The last piece of the Master Plan also includes a new Waterfront Development District in East Hartford, giving residents of both communities access to retail, dining, and entertainment services. This Master Plan was implemented through careful consideration of existing neighborhoods, communities, and infrastructure, and was helped along by research involving the Interstate Highway System, flood mitigation, green development, and sustainable urban design. The Master Plan was also helped along by research of cities with similar situations all across the United States of America.

The second piece of this thesis project uses the new Master Plan to develop an architectural intervention along the Connecticut River that embodies the overarching point of the thesis research. This architectural element takes the form of a habitable bridge,
anchored in both existing structures, and newly implemented infrastructure from the Master Plan. The connections that this bridge creates, whether they be physical, social, or economical, clearly exemplify the type of sustainable city this thesis believes Hartford can become. Hartford’s lack of “slow” infrastructure across the Connecticut River has somewhat barred the two sides from interacting in ways that effect the Triple Bottom Line. If one cannot easily cross the River for everyday errands or special events, that hurts the People and the Profit of Hartford’s Triple Bottom Line. The lack of services in the downtown neighborhood such as food sources, shelters, and job centers also hurts these two branches of the Triple Bottom Line. As this thesis will show in more detail in a later section, without affordable housing, walkable communities, or good social dynamics, cities cannot sustain themselves. The carefully thought out program of this bridge was designed from the most dire needs of the community surrounding the site and organized in a way that it is easily accessible by the citizens of Hartford. The design of the habitable bridge also comes from research on affordable housing, green development, and sustainable urban design, as well as studies of previous and current structures that achieve the desired connections across bodies of water in similar, successful ways. The habitable bridge design is also derived from the structural elements of cable-stayed bridges, as well as various site elements which helped to dictate orientation, building shape, and user accessibility and movement.

Together, these two elements of the overall thesis combine to create a more sustainable, affordable, green future for the City of Hartford and its residents, while also helping communities outside of Hartford as well, such as East Hartford, Windsor, or Wethersfield. The following pages of this thesis explains, at length, how this goal is achieved, and the ideals that brought the project to reality.
CHAPTER 2

LITERATURE REVIEW

2.1 Interstate Highway Systems in Urban Settings

One would think that a symposium on the “new” highway system (in the 1950s), and its effects on urban areas would be organized by the state or local government. In the case of Hartford, however, this is untrue. In 1957, the Connecticut General Insurance Company (now CIGNA), one of Hartford’s largest corporations, organized this symposium to trade knowledge and get the word out about the new interstate highway system and how it could help, or hurt, Hartford’s communities. This act alone proves that even before the highways existed, Connecticut’s Department of Transportation was not on the ball. This symposium was so informative on the topic of highways in urban areas that it was published by the Urban Land Institute, a non-profit think tank, as a bulletin to all of its members across the globe.

The symposium was held in Hartford in September of 1957, yet the topics were meant for a broader look at every American city effected by the new Interstate System, not just the Insurance City, including the highway systems’ role in land use, economics (in the form of production and merchandising), housing impact, and mass transit (both public and private) in urban areas. The symposium ended with a look to the future, challenging governments and cities to work together to use the highways as a “tool for the future city.” This symposium drew experts from all professions, from bankers, to professors, to real estate analysts. There were leaders from the Port of New York Authority (now the Port Authority of New York and New Jersey, or PANYNJ), the Ohio State Department of Highways, and director of the Chicago Area Transportation Study. The deck was stacked with experts in all fields.

As stated by the Urban Land Institute in the Forward, “the fact remains that only recently have those charged with the building of our facilities for moving people and goods become aware that the implications of what they do extends far beyond the strips of concrete they locate and lay down for wheels and wings of transport; implications which involve the very roots of our national economy and urban environment.” It is encouraging to see that there were so many people concerned with this issue during the time of the
implementation of the Dwight D. Eisenhower National Highway and Defense System, although disheartening that in today’s day and age (specifically in Connecticut), the highways and other transportation issues have become an authoritarian issue settled at the gubernatorial political level, with little-to-no involvement from the cities they cut through. This is true of so many issues in the modern era United States, being “taken care of” by politicians with no input from citizens, no voting to see if this is really what the people are looking for. The years of “by the people, for the people” have seemed to dissipate into the air like a puddle evaporating from a pothole after a long, Connecticut winter. The State of Connecticut, and eventually the rest of the United States, needs to think before acting, plan ahead, and see the implications of these transportation projects. Their current solution of putting band-aids on bullet holes is not a lucrative one.

In the first section of the symposium, entitled “The Relationships of Highways to the Pattern of Land Use,” Edward Ackerman speaks on the issues of “The National Environment of Urban Growth and Highway Construction.” Edward Ackerman was the Director of the Water Resources Program, which was a project by Resources for the Future, Inc., or RFF. RFF is a non-profit organization dedicated to environmental, energy, and natural resource issues. Ackerman received his PhD in Geography from Harvard University in 1939. During World War II, Ackerman assisted the allies with intelligence on the different geographies of the European and Pacific Theaters. He then was appointed Topographical Intelligence manager for the OSS Europe-African Division. Post-WWII, Ackerman helped develop policies for the management of Japanese resources during the U.S. occupation of Japan. He was the Water Resources Director for RFF between 1954 and 1958. Ackerman was also the Director of the Carnegie Institute until his death in 1973.

In his opening remarks, Ackerman states that cities come from the need of the countryside to conduct trade of goods, services, and nourishment in a centralized locale. He states, “it is axiomatic that a major route crossing, focus, or terminus inevitably produces an urban settlement.” It is unknown whether or not Ackerman was aware that this is precisely how Hartford came to be. Situated directly in between New York and Boston, New Haven and Quebec, Hartford was a crossroads of trade. It started as an outpost

1 (Connecticut General Life Insurance Company): 7
on the Connecticut River for the farmers and fur traders, both settlers and Natives alike. It then grew to a fort, to protect those traveling to ply their trade. The fort then eventually led to a city. Ackerman goes on to say that because of this nature of urban growth, any changes to the way people are transported into or through an urban area, or changes in the placement of the “transportation arteries”, as he calls them, would have effects on the urban environment. He warns that a major project like the National System of Interstate and Defense Highways will have “a lasting and profound impact upon the form, size, and character of many American cities.”

Ackerman later speaks on the problems of planning, citing central zone congestions and changes in a city’s nature as two of the more pressing issues, along with interregional connections. He goes on to use the example of the “Northern Urban Zone” (as depicted in a map published on October 17th, 1957 at the front of the publication showing the designated Interstate Highway System routes. The Northern Urban Region consists of all states north of the Mason-Dixon line and east of the Mississippi River, also including Minnesota, Iowa, and Missouri) to show an imbalance of highway mileage compared to the rest of the country in relation to needs. The Northern Urban Region had 11,000 miles of proposed highway as of 1957. This is in spite of the fact that the northern region of the United States is much denser and its urban centers re much closer together, not really needing additional direct connections between urban centers. Ackerman goes on in his statement by speaking about the problems of interregional connections. He states that although the system as a whole seems well planned out at a national scale, when zoomed in to a regional or urban scale, it loses its credibility. He states that “the summer recreational needs and demands of the northern region also are not reflected in expressway connections with northern Wisconsin, the upper peninsula of Michigan, and the central and eastern coast of Maine.”

In the three states given as examples here, there is only one or two highways moving through the states, mainly transporting from city to city to out-of-state. In Maine, for example, which has only one interstate running through the entire state, the route travels along the coast to Portland, where it then moves north through Augusta and Bangor, ending finally at the Canadian border near Houlton. This leaves the entire Maine

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2 (Connecticut General Life Insurance Company): 7
3 (Connecticut General Life Insurance Company): 12
coastline east of Portland to be underserved by the Highway System. Whereas if you’re a tourist from out of state, a little extra time winding through local roads to get to your beach destination isn’t such a damper on your holiday, if you’re from Central or Northern Maine, you’re out of luck. Similar situations could be said for Wisconsin and Michigan as Ackerman explained it.

As far as the Connecticut General Life Insurance Company’s symposium on The New Highways goes, Ackerman’s take on The National Environment of Urban Growth and Highway Construction is a refreshing way to start a conversation on highways in the urban environment. Praising the windfalls while criticizing the pitfalls, all while warning us that change, however inevitable, should be approached cautiously. Ackerman’s tone sets the stage for the rest of the members of the symposium to critically view this new system that could change the course of American living, rather than the present-day approach of just accepting the current systems of transportation and doing nothing to improve them. If the current people in power want to see the correct way to improve Connecticut’s Capitol Region, they need not look any further than Connecticut General Life Insurance Company’s example.

2.2 Waterfront Redevelopment

Susannah Hagan is the author of *Taking Shape: A New Contract Between Architecture and Nature*. She is the founder of The R_E_D Group (Research into Environment + Design)⁴, and she is currently a professor and School Research Leader at the Royal College of Arts School of Architecture in London. Her work with R_E_D includes a project called “EMPTYing CITIES”⁵, a research-by-design project on the issue of post-industrial cities and the loss of population. They have also worked on what they call EnLUDe (Environmentally Led Urban Design) projects, one in São Paulo, Brazil, and one on a high-risk floodplain of the Thames River in London. She has received fellowships from the Institute for Urban Design (now the Urban Design Forum) in New York and the Royal Society for the Encouragement of Arts, Manufactures, and Commerce (RSA) in London. The latter also made her a member of the International Development Network, the

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⁴ (The R_E_D Group, 2010)
⁵ (The R_E_D Group, 2011)
RSA’s network of individuals dedicated to sustainable development across borders. She is also a member of the Royal Town Planning Institute, a group of planning professionals in Ireland and the United Kingdom.

In *Taking Shape*’s Introduction, Hagan starts off by stating that the first half of the book’s title, Taking Shape, “emphasizes the still emergent state of an architecture that is engaging in a new contract of cooperation between built and natural environments.”\(^6\) Hagan introduces the thought that because the idea of Sustainable Architecture is still relatively new, there is currently a debate on how to accomplish sustainable design. This splits architects into two camps: those who would like to see the built environment return to a pre-industrial era, and those who would like to use current and develop new technologies in order to achieve sustainability. Both parties, however, are driven by the desire to “operate in the world less destructively”. Of course, as with most divisions, there is a small group of people who take from both ideas and create their own style. These people, Hagan explains, design with both “expression and operation”, which seems to equate back to the form vs. function debate that Hagan speaks of later on in the chapters. Hagan says that this balance allows a wide range of technologies to be introduced into the already established architectural styles and forms we currently use. Hagan states that this type of thinking is looked at as something “aimed at achieving stasis rather than embracing change.”\(^7\) Hagan says that in this book she seeks to decode why this aspect of sustainability in architecture is perceived so conservatively.

Hagan then continues her analysis of her own book title, explaining that the “contract” eluded to in the second half of the title is, of course, the contract between nature and the built environment. She explains that this is obviously not a new contract, but it does require a look back to restore the relationship as it was before the industrial era. She emphasizes that restoring this relationship does not necessarily mean taking design and design technologies back to pre-industrial times. She stats that we can use new and future technological means to reach the same ends that occurred during the pre-industrial era. However, Hagan and others prefer that these technologies not become, as she calls them,

\(^6\) (Hagan, 2001: x)
\(^7\) (Hagan, 2001: xi)
“double-edged swords.” Most people would prefer that these technologies cannot be used for both good and immoral purposes. Hagan gives the example of genetic engineering, saying that it can either be used for redesigning humans before birth, or creating waste-eating bacteria. She then gives an example of a building technology she believes is non-exploitive, photovoltaic cells.

Hagan continues in the introduction to go into the history of the switches between the terms Green Architecture, Sustainable Architecture, and Environmental Architecture. She then ends up speaking on the issue of politics, saying “if social change doesn’t arise democratically from the bottom up, it will be imposed from the top down.” This thought ignores what is actually happening in the world, because reality shows that change for the sake of the environment is praised democratically, while the “top down” approach seems as if it will never occur in the political climate. Hagan shows the reader hope in the form of democratic decisions being utilized in countries such as Germany and Scandinavia, but rips that hope away by stating that these changes are “inadequate to the size of the environmental problem,” i.e., change can only be achieved if the entire world population participates. Hagan proposes that since architecture produces and contributes to global culture, it has a duty to use its influential voice to advocate for positive change.

It is at this point in the introduction that Hagan introduces three criteria to consider in the engagement with environmental design: symbiosis, differentiation, and visibility. Symbiosis deals with the cooperative engagement between building and environment. Differentiation allows the architectural to be more influenced by the environmental. Visibility speaks to the future, through the possibility of new forms and technologies. Hagan has derived these three criteria from both contemporary architectural theory and current environmental design practices. It is this dichotomy that brings Hagan back around to the centuries old debate of form versus function. Hagan first describes it as the environmental and the aesthetically experimental. Aesthetically experimental refers to form, while environmental refers to overall function, not of space, per se, but of the built environment in nature. Hagan ends the introduction with the thought that inclusive

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8 (Hagan, 2001: xii)
9 (Hagan, 2001: xiii)
10 (Hagan, 2001: xv)
architecture can embrace both operation & formal expression. The overall argument of Taking Shape pleads that form and function do not need to be opposites in the fight for environmental architecture, but one hand can wash the other in the sense that aesthetics does not need to suffer in order to achieve sustainability.

### 2.3 Mixed-Use and Mixed-Income Development

In Chapter 10 of *Towards Sustainable Communities: Solutions for Cities and Their Governments*, entitled “Housing and Community Development,” Mark Roseland begins to discuss affordable housing and its role in creating and maintaining healthy, vibrant communities. Roseland starts out the chapter by explaining that “there are numerous ways that citizens, businesses, organizations, and local governments can help ensure that housing not only meets personal needs in an affordable and resource-efficient manner, but also does so in a way that fosters connection, neighborliness, and social equity.”

This statement frames the structure of the chapter ahead, where Mark first speaks on how to achieve affordability in housing, and then goes on to show the various methods of how affordable housing can be used to foster a greater sense of community, improving a neighborhood’s overall “health” (both literal and figurative).

Roseland first describes the housing crisis, saying that homelessness and people with unaffordable, inadequate shelter are ultimately two sides of the same coin. He starts to delve into the definitions of affordable housing, stating that anything below 30 percent of the household gross income is considered affordable, and “some American states also tie housing affordability to local economic conditions and incomes, adjusting the definition further for those earning 20 percent less than the local average income.” Since the real estate market is ever-fluctuating, this percentage can still not be enough sometimes for people to qualify for affordable housing. Roseland drives this point home by saying that “the majority of affordable housing is used by working [class] people who are simply caught in the squeeze between rising housing costs and eroding wages.”

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11 (Roseland, 2012: 177)
12 (Roseland, 2012: 178)
13 (ibid)
Roseland’s overall argument at this point in the chapter is the fact that affordable housing is a need for all communities of all types, whether they be urban, rural, rich, or poor. Roseland goes on to further discuss the economies of affordable housing, including ways to promote affordable housing in communities, through both public and private channels. Of course, there are usually policies in place by local governments in this day and age to ensure affordable housing is achievable, such as zoning regulations or developmental requirements that a certain percentage of built units must be affordable. Private initiatives, such as Housing Co-operatives or Community Land Trusts, can also be used to ensure a more affordable way of life while also fostering a sense of community with the residents. These organizations are usually run by the residents of a neighborhood or smaller community, and pool resources in an effort to restrict the cost of housing available or to keep the cost low when homes are resold. For example, in a Community Land Trust, since the land itself which a house sits on is owned by the neighborhood and “rented” to the homeowner, the value of the home itself becomes more affordable for someone living there. This method could be of great value to a city like Hartford, where the newly developed land outlined later in this thesis is already owned by government agencies and could be easily transferred to a community organization in order to procure more affordable housing in the area. There are also several non-profit or public organizations that deal with affordable housing costs, such as the widely known Habitat for Humanity, or other local organizations which help with the financing or subsidizing of affordable homes.

Mark then explains other ways to help affordable housing along in communities, by providing financial incentives. One such incentive is described as Location Efficient Mortgages, which Roseland explains encourages homebuyers “to settle in communities where public transit, work, shops, and other services are close by.” This method not only allows for more affordable housing for residents, but also increases the overall sustainability of an area by promoting more walkable communities with access to mass transit. This is ideal for an urban center such as Hartford, which has seen much flight and

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14 (Roseland, 2012: 181)  
15 (Roseland, 2012: 186)
neglect over the years and would thrive on an opportunity for a more walkable, serviceable neighborhood.

At this juncture in the chapter, Roseland starts to discuss how affordable housing ties back into community development. He claims that “closeness to other people is mirrored in closeness to nature and integration of ecology into community living.” For example, when one lives in a community with a connection to nature, such as a park, one becomes closer with one’s community. When out in public parks, people interact more with others than if they were just at home. It is a friendlier way of getting to know those who live closest to you in a more pleasant setting. Overall, a deeper connection both with one’s neighbors and with nature enhances one’s quality of life in a way that relates back to Roselands call at the beginning of the chapter for “safe, affordable, healthy” living.

Roseland continues this thought by stating that these physical attributes of a neighborhood cannot act alone in creating livable communities, but must coexist with more intangible qualities, such as government policies and community activities. This can actually already be seen in Hartford with the implementation of Mortensen Riverfront Plaza and the newly constructed Dunkin’ Donuts Park. Both entities have community events year-round which draw crowds together and enable members of the community to experience safe, fun activities with other like-minded individuals from their neighborhoods.

Roseland’s final point in this chapter is the role affordable housing plays in creating healthy communities. Not only physical health, but also social health as well. Roseland describes a healthy community as one which includes “equality amongst all residents and provides access to clean air and water, healthy housing that is affordable and safe, equal access to health services, healthy food options, secure jobs, and education.” Roseland goes on, saying “a healthy community promotes mental and physical health and provides equal access to greenspace and community facilities.” This definition of a healthy community is one which the City of Hartford could use to improve its communities. As they currently

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16 (Roseland, 2012: 188)
17 (Roseland, 2012: 178)
18 (Roseland, 2012: 189)
19 (Roseland, 2012: 190)
stand, most communities within Hartford have little to no access to fresh, healthy foods, and the job market and education facilities have not yet reached their full potential. However, according to Roeland, by combining affordable housing means and methods with access to nature and community events, one could see how easy it would be to turn Hartford around for the better. By creating a more natural waterfront, giving access to the Connecticut River to a wider variety of residents, one can take pride in their community while walking along the riverbanks. By including basic necessities nearby to the new housing developments, one can have easy access to jobs, food, and healthcare facilities. Finally, by implementing both indoor and outdoor public spaces designated for community use for both public and private events, one can interact with their fellow neighbors in a way that provides possibilities of new relationships through mutual interests. Overall, combing all of these methods of mixed-use development with the implementation of mixed-income housing, one can start to see a more friendly, thriving community take shape.

2.4 Urban Design

Peter Calthorpe’s ideas in The Regional City for how to fix the way cities experience urban growth are extremely policy-based, but he does discuss in depth in the Introduction and Chapter 3 (entitled “Designing the Region”) his proposals for better methods of urban design. Calthorpe graduated from the Yale School of Architecture with a B.A. In 1983 he founded Calthorpe Associates, a San Francisco-based architecture, planning, and urban design firm. He is also a founding member of the Congress for the New Urbanism, which is an “international non-profit organization working to build vibrant communities.” Calthorpe is also the author of the first Transit-Oriented Development Guidelines, developed for the City of San Diego in 1992. Calthorpe’s most recent contribution to the world of urban design, however, is the most interesting. Through Calthorpe Analytics (a new, company separate from Calthorpe Associates), Peter Calthorpe has developed a new kind of planning software called UrbanFootprint.

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20 (Calthorpe Associates: About)
21 (Congress for the New Urbanism: About)
22 (CityLab.com: 2018)
23 (Calthorpe Analytics: About)
UrbanFootprint is unique in the way it allows everyday non-professionals to view existing conditions of anywhere within the United States, try out however many planning situations they can come up with, and view the results. Calthorpe has also given a TEDTalk on the subject of urban design, entitled “7 Principles for Building Better Cities,” and has taught at several universities throughout the United States.

In the Introduction to *The Regional City*, Calthorpe tries to explain his disdain for urban sprawl, and his solution for the current system of urban development, what he calls “Edge Cities.” Edge Cities, as Calthorpe explains, is a term for the current suburban centers equipped with regional retail like big box stores or strip/shopping malls, as well as the standard town centers one sees in the suburbs filled with local retail and dining, etc.\(^{24}\) He argues that spreading out so vastly as sprawl has done has lead us to rely heavily on one single mode of transportation above all others: the car. Calthorpe also argues that sprawl has sped up the segregation of communities “by age, by income, by culture, and by race.”\(^{25}\) He discusses the term “community of interest” as the way people are settling currently. That is, we move to a neighborhood with people who are similar in income, career, age, and lifestyles. As Calthorpe explains, “it is the ‘gated community’ of the mind.”\(^{26}\) In contrast, before the sprawl of World War II, communities were much more diverse and interactive. Presently, people do not interact as much as they used to in these urban neighborhoods. There are less spaces for interaction in these communities of interest, and the people living in them usually take the car from point A to point B, usually to places that Calthorpe defines as “remote.” Calthorpe then addresses one of the reasons it has been this way for so long: policies and politics.\(^{27}\) He explains that the people live somewhere in between the neighborhood and the regional scale, in a constant battle between local ordinances and regional plans that don’t complement one another, or sometimes don’t even know that the other exists. He lists out several policies having to do with taxes, zoning, environmental impacts, etc., and states that the main problem with the Edge Cities is that they take all of these policies and piece them together sporadically, in a sort of mix-and-

\(^{24}\) (Calthorpe, 2001: 2)
\(^{25}\) (Calthorpe, 2001: 3)
\(^{26}\) (Calthorpe, 2001: 3)
\(^{27}\) (Calthorpe, 2001: 4)
match way that benefits only the newer, farther out suburbs. This leaves the cities and the “first-ring” suburbs to fend for themselves.

Here is where Calthorpe develops his idea for the Regional City. By viewing the area as a region, inclusive of edge suburbs, first-ring suburbs, and cities alike, one can start to see the impact all of these pieces have on each other and how they need to be integrated fluidly, rather than isolated. In a good regional transportation network and regional greenspaces, Calthorpe sees a successful, integrated region that works to keep the less-advantaged areas from decay. In this way, Calthorpe explains, “the successful evolution of each--region, suburb, and city--is tied to the others.”

In Chapter 3 of *The Regional City*, entitled “Designing the Region”, Calthorpe goes on to explain more of the design-based aspects of planning the region. As Calthorpe puts it, “too often we plan and engineer rather than design.” He suggests that engineering a region merely fixes smaller elements, while planning a region tends to be broader and more uninterested in the details. He argues that these two equal and opposite reactions need to be brought together into a *design* in order to take a look at and improve the whole system.

Calthorpe argues that there are three things to consider when designing the region: Diversity, Conservation, and Human scale. In order to design for the human scale, one must separate themselves from top-down policies and housing projects and get back to the John Mellencamp-esque “small town” thinking. Calthorpe sees that people want to get back to walkable streets lined with trees and lamps, peppered with storefronts that face the street and upper floor windows that top out at three or four stories. He concludes that people “idealize Main Street shopping areas and historic urban districts” more and more. This is in stark contrast to sprawl and today’s thinking of urban design, where there are office parks surrounded by parking lots in the middle of nothing, and shopping plazas surrounded by the same in which the storefront mentality is long lost. There is no longer integration of work, life, and play. In this thinking of the “gated community of the mind,” Mellencamp’s

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28 (Calthorpe, 2001: 6)
29 (Calthorpe, 2001: 43)
30 (Calthorpe, 2001: 46)
mentality can also be seen from his analysis (and criticism) of the “American Dream” in *Pink Houses*:\(^{31}\)

There’s a black man with a black cat
living in a black neighborhood
he’s got an interstate running through his front yard
you know, he thinks he’s got it so good.

Mellencamp is taking one very specific part of the segregation aspect to Calthorpe’s theories: actual segregation of neighborhoods, yet he also touches on the segregation of zones. The line “an interstate running through his front yard” implies that the automobile is the dominant form of transportation from residential to commercial spaces, and the next line of “he thinks he’s got it so good” implies that everyone just believes this is the way it should be. Mellencamp shatters this illusion with his line “well there’s people, and more people/what do they know/go to work in some high rise/and vacation down at the Gulf of Mexico.” With these lines, he’s touching upon both Calthorpe’s ideas of wealth inequality in a region and the isolation one feels in modern neighborhoods. With the implication that everyone in the “middle class” vacations in the same spot, he shows how wealth plays a part in this dream. Similarly, with the implication that the same “middle class” all works in an office, he is implying the fact that people are now simply going from home, to car, to work and back again. Nevertheless, it seems both Mellencamp and Calthorpe believe that designing the region for the human scale includes a focus on the local small business economy and the local greenways and green spaces, and how to tie those detailed aspects back to the region as a whole.

Along with human scale comes diversity. Calthorpe’s idea of the regional city includes a long, hard look at ways to ensure “the creation of communities that are diverse in use and in population.”\(^{32}\) He proposes the return of the mixed-use neighborhood as a way of getting back on track with this mentality. Calthorpe also states that diversity in economy is key as well. The current state of the world indicates that a mix of small independent businesses, regional chains, and national/global retail chains is needed to keep the current economy and quality of life alive. A final aspect of diversity in terms of the

\(^{31}\) (Mellencamp, 1983)
\(^{32}\) (Calthorpe, 2001: 46)
regional city is that of ecology. The spaces designated for recreation, agriculture, and conservation are all a part of the diverse spaces a region requires to keep its people happy.

Lastly, there is the topic of conservation. Conservation is including (but not limited to) conservation of habitats of local species (see above paragraph), conservation of energy and sustainable design, and conservation of history and vernacular architecture. As said earlier, conservation of important ecological spaces and elements is key to connecting the region. Conservation of resources and energy, while not exactly key to the connection of the regional city, is key to the impending state of the regional city. While conservation of resources looks to the future of the region, conservation of historic buildings and neighborhoods looks into the region’s past to bring back the regional city’s small town feel that adds to the human scale so nicely.

Calthorpe started off this book in the introduction by saying that there was somewhat of a divide between the neighborhood and regional scales which is impeding on the success of the regional city. In this part of Chapter 3, entitled “Designing the Region is Designing the Neighborhood,” he proposes what could happen if the neighborhood and the region were designed together in the principles of human scale, diversity, and conservation. Calthorpe first defines that a “region and its elements—the city, suburbs, and their natural environment—should be conceived as a unit, just as the neighborhood and its elements—housing, shops, open spaces, civic institutions, and businesses—should be designed as a unit.” In this way, Calthorpe explains, a “region can be designed in much the same way [one] would design a neighborhood.” He states that both the larger view of the region and the more detailed view of the neighborhood require similar aspects: a civic center, circulation systems that relate to the human scale, open space corridors, and, of course, what Calthorpe calls his system of “integrated diversity.” He compares major open spaces to neighborhood “village greens”, the central city in the region to the town center, and transit systems like light rail, bus, and bikeways to the pedestrian circulation and sidewalk infrastructure in the neighborhood.

Calthorpe then describes what he calls the “building blocks of the region”: centers, districts, preserves, and corridors. Centers are described as the destinations at the
neighborhood, village, town, and urban scale. Districts are described as special-use areas, such as airports or universities. Preserves are described as the open space elements the protect ecological life and agriculture, and sometimes frame the region (in the case of Salt Lake City, the mountains to the east and the Great Salt Lake to the west frames the region into a narrow corridor). Lastly, corridors are described as the connecting elements of the region, “based on either natural systems or infrastructure and transportation lines.” Natural system corridors, such as greenways, rivers, or park systems, are a more intimate, walkable corridor, while transportation corridors are for mass movement of people throughout the region. Calthorpe then explains that these four elements must be integrated cohesively and work together in order for the regional city to take shape and thrive.

In conclusion of Calthorpe’s chapter on “Designing the Region”, Calthorpe clarifies that the answer to sprawl and inequity is not a simple return to the “small-town” way of thinking or a continuation of what he describes as the “fractured urbanism of many modern cities,” in which patches of urban renewal are thought to fix everything. He is stating that the only way a sustainable region can thrive is if both the historical and the contemporary work together to find balance of the regional and neighborhood scale. Integrating the local, regional, and global cultures and markets into one Regional City can help shape a region that can support new growth and maintain current trends at the same time.

2.5 Water Mitigation & Management

Gilbert F. White, a Geography professor at the University of Colorado in the 1970s, had spent most of his life advocating for natural floodplain management before his death in 2006. This earned him the unofficial title of the “Father of Floodplain Management.” His 1945 dissertation for his PhD, entitled “Human Adjustment to Floods”, turns the traditional US take on flood control on its head. Instead of hiring the Army Corps of Engineers to build seawalls, and dams, and to bury rivers underground, he offered the solution that it’s not nature that’s the problem, it’s humanity. By designating areas around bodies of water as floodplains, and by limiting the development in these areas, the damage
caused by floods and weather events can be lessened, by the sheer fact that there is nothing to damage.

In chapter Two of his dissertation, entitled “Elements of the Flood Problem”, White explains the four parts of what he calls the flood problem. They are the flood hazard, the flood plain, the human occupation of the flood plain, and the adjustment of human occupation to flood hazard.\(^{36}\) Flood hazards are self-explanatory, as the hazards that occur from a flood event, such as injury, death, or damage to infrastructure or property. The flood plain is defined by White as the “land outside of a stream channel described by the perimeter of the probable limiting flood. It is land which is not covered by the stream at low flow or average flow, but which has been flooded in the past or may be flooded in [the] future.”\(^{37}\) The human occupation of the flood plain is also a bit self-explanatory, as it is any change humans have made to floodplain areas by the sheer act of being present in the area. This could include residences built in floodplains, factories, offices, roads, or even recreational parks and trails. In Hartford’s case, the city has all the above.

White then goes on to define human adjustment to floods. He outlines these as any adjustments made to the floodplain as a result of human occupancy and flood events. Better put, what people do to a floodplain once they have seen that they could be in danger of flooding. He goes on to list all of the adjustments: land elevation, flood abatement, flood protection, emergency measures, structural, land use, relief, and insurance.\(^{38}\) He defines all these terms as well. Land elevation is defined as any building up of the floodplain to remove/reduce the possibility of the area being flooded. Flood abatement is defined as any modifications made upstream from a floodplain to prevent the floodplain from obtaining flood levels. Flood protection is the act of building any engineering feats (such as levees, flood- or seawalls, or reservoirs) to prevent the floodplain from obtaining water. Emergency measures is defined as any “temporary removal or protection of property and persons,”\(^{39}\) such as flood evacuation routes. White defines structures as any non-hydroengineering structure (a building, a road, etc.) placed to block the floodwaters from

\(^{36}\) (White, 1945: 36)
\(^{37}\) (White, 1945: 44)
\(^{38}\) (White, 1945: 47)
\(^{39}\) (ibid)
arriving at the floodplain. Land use is “the arrangement of the pattern of land use of a floodplain.” Relief is the act of granting private or public funds or assistance to the victims of floods, and insurance is “the accumulation of premium payments from property owners in order to compensate them for losses resulting from floods.” Some of these adjustments are built up, physical entities, while others can be achieved with good planning and the introduction of civic policies. Many cities in the United States, including Hartford, use one or more of these adjustments to deal with flooding. In Hartford’s case, only the adjustment methods of land use and flood abatement are not used.

After explaining the nuances of human adjustment to floods, White clarifies that these adjustments sometimes bring about human readjustment to floods. Readjustments are seen as any attempt to rectify adjustments that did not work the first time around. White goes on to say that these readjustments can, of course, lead to social costs and social benefits. The benefits are seen immediately: no or reduced probabilities of flooding. The costs may be seen a little more over time, i.e. lowered citizen enthusiasm (when people have to keep evacuating, or replacing property, etc.). In most cases, the benefits outweigh the costs. However, there can be other costs to the readjustments of floods, such as reneged access to a city’s waterfront.

In chapter four of White’s dissertation, entitled “Adjustments to Floods,” he explains the formula for adjustments or readjustments to flooding. The formula is as follows:

\[
\text{Economic Justification} = \frac{\text{Advantages of Site} + \text{Benefit from Readjustment}}{\text{Disadvantages of Site} + \text{Cost of Readjustment}}
\]

He simplifies this equation as so: \( \text{Economic Justification} = \frac{\text{Benefits of Protection}}{\text{Costs of Protection}} \)

Obviously, as stated above, if the benefits outweigh the costs, and there are little to no disadvantages to relocating the site from the floodplain, then it makes more sense economically to readjust than to keep the status quo and pay damages for every flood event. Thus, a person with a stake in a floodplain area, be it property, or business, etc., has to

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40 (ibid)
41 (ibid)
42 (White, 1945: 48)
43 (White, 1945: 129)
consider moving away from the dangers of the floodplain. If one can live with the damages of being in the floodplain, one can remain within the floodplain and utilize the relief and insurance adjustments as one sees fit.

White then explains both the benefits and costs of flood protection. He breaks it down into four main categories of flood protection: levees and floodwalls, channel improvements, channel diversions, and reservoirs. As White puts it, “Taken as a group, these works have been planned from a viewpoint which ignored certain important benefits and costs of the protective work itself, as well as the whole problem of whether or not floodplain occupance deserved to be continued or modified.”

The governing bodies and engineers who implemented many of these flood protection methods did not even think that removing occupancy of the floodplain was a viable option. In the case of Hartford, the Army Corps of Engineers spent approximately $71.5 million—approximately $1,308,881,028 in 2019—to bury the Park River, rather than to suggest to the people living next to it to move (even though those residence would be forced out a number of years later due to the city’s urban renewal projects) away from the floodplain.

It is clear that the Army Corps of Engineers believed that the benefits of burying the Park River and ideally never having flood issues on that floodplain again would greatly compensate the overall costs of the project. This may be so, as there has not been any significant damage in that area since the burial of the riverbed. However, there are other costs to the Park River burial. By burying the river only up to a certain point in the city, if there was a significant flood event, the tunnel openings would carry all of the floodwaters right to unsuspecting neighborhoods who thought they were safe, being miles from any significant body of water. There are also costs that are not flood related. Burial of the river has detrimental effects to native species of vegetation and wildlife that could be beneficial to flood mitigation, as well as the de-beautification of one of Hartford’s city parks (and making one of Hartford’s most treasured landmarks obsolete in the form of the Soldier & Sailors Arch Bridge, which now is a bridge which sits on grass, at grade). By moving the occupation of the floodplain at least one block in either direction of the banks of the Park River, and uncovering the river itself, the flood problem would not be as severe, while

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44 (White, 1945: 140)
45 (United States Army Corps of Engineers)
allowing residents, workers, and other citizens to enjoy a more natural landscape in the heart of downtown Hartford.

Of course, with the development that has happened since the river has been buried, this is easier said than done. Therefore, using the existing grading of the street level and the highway covering the river, it is possible to grade the floodplain to have water flow away from important infrastructure and property, into a more open, unused floodplain area that can be designated at the current time. The south banks of the old river are much more open and less occupied than the north side is currently. The north side, in fact, has just densified even more, with the completion of the Front Street District. With the redistribution of land use to the south, one can help humans in Hartford readjust to floods.
3.1 Pittsburgh Point: Pittsburgh, PA

Urban Renewal in the United States has been present since the Interwar period. However, large-scale urban renewal in US cities really started taking form after World War II, in the 1950s and 1960s. The first major urban renewal project in the United States was the redevelopment of Pittsburgh’s Golden Triangle District. The Point of this triangle, where Pittsburgh’s three rivers converge, previously was home to a large industrial area and train yard, where all of Pittsburgh’s steel would be loaded to be shipped across the country. There were two bridges very close to the Point, closing off the tip of the triangle. These rail yards were littered with abandoned buildings and lots. All of this, along with the thick smog that covered the area because of the steel manufacturing, Pressed officials to improve Pittsburgh’s quality of life, and thus, the city’s urban renewal began. This is a prime example of Urban Renewal’s success. Today, the Golden Triangle neighborhood is a flourishing downtown district with many plazas and parks littered throughout.

Figure 1: Pittsburgh Point, 1950s
It can be argued that this success can be attributed to the inclusion of natural resources (such as the three rivers), and addition of green spaces into the plan for urban renewal.

3.2 Bricktown Canal: Oklahoma, OK

The first case study to see the effects of greenspaces on urban renewal is Oklahoma City, Oklahoma’s Bricktown neighborhood. In the late 19th and early 20th century, the area in downtown Oklahoma City (OKC) currently known as Bricktown first started to develop as rail yards and storage houses for the cargo trains coming into downtown OKC. These two-to-three story brick buildings earned the neighborhood its name. The onset of the Great
Depression, as well as the suburban sprawl and interstate highway system that occurred post World War II, caused the neighborhood to be almost completely abandoned by the 1980s. In the early 1990s, the mayor of Oklahoma City created the Metropolitan Area Projects Plan (MAPS). This program, which collected voter-approved taxes for five years and deposited them into a special City budget specifically for capital improvements, was the main funding for Bricktown improvements, starting with the Chickasaw Ballpark and the Bricktown Canal, both integral parts of the neighborhood’s current success.46

With its first game in the spring of 1998, the Chickasaw Bricktown Ballpark brought people back to the neighborhood. However, the neighborhood was not utilized when the park was not open. Realizing the community needed something to not only draw the people in, but keep them there, in 1999, the Bricktown Canal was complete. The Canal, a mile-long body of water lined with trees and walking paths, starts just east of the Santa Fe Depot. It continues east toward the ballpark; once at the ballpark it turns south, then winds its way through the neighborhood, ending at the Oklahoma River, a little bit south of Bricktown. The termination at the River includes the City Boathouses and Regatta Park (completed in 2004), home to the Oklahoma Regatta Festival, held every Fall.47

Once the Canal and park was constructed, Bricktown became a brand new destination for residents of Oklahoma City. The development started with key anchor stores: Mickey Mantle’s Steakhouse in 2000, the Harkin Cinemas Bricktown 16 in 2003, and Toby Keith’s Bar & Grille in 2005. Soon after these entities arrived, many of the brick buildings for which the neighborhood gets its name were converted or replicated for mixed use development, allowing for more commercial and retail, and a bit of residential as well.

46 (City of Oklahoma: MAPS History)
47 (Bricktown: About)
Figure 3: Bricktown Fountain

Figure 4: Bricktown Canal Mural
Bricktown today is a thriving community with events that stand alone from whether the ballpark is open or closed. It can be argued that this is attributed to the installation of the Canal. Even though the neighborhood was undergoing some urban renewal, it was the inclusion of the waterway and green space that really got people to use the rejuvenated urban environment. This scenario can be backed up by looking at a similar case. Hartford, CT recently built Dunkin’ Donuts Park north of their downtown neighborhood to revitalize a community that has been neglected for decades. The ballpark is a success, but before and after games, and between seasons, the space is not utilized whatsoever, just like Bricktown in the late 1990s.

### 3.3 Waterfront Park: Portland, OR

The second case study on the positive effects of natural resources and greenspace in urban renewal comes to Portland, Oregon. By the 1970s, with suburban shopping malls taking customers from the downtown, Portland’s officials requested the help of New York’s Great Planner Robert Moses. His vision was to eliminate Harbor Drive, the freeway
along the waterfront, and create a freeway loop around the downtown area to serve the outlying communities. After Harbor Drive was demolished in 1974, Waterfront Park was opened in 1978. The need for waterfront greenery was established well before this, however, in a report by F. L. Olmsted in 1903. Regardless, the opening of the park immediately drew in residents. The success of the new park lead to numerous city improvements in the 1980s, including a light rail system. In 1990, an urban shopping mall was built downtown because of the need for more retail space. The city has flourished ever since, and continues to develop today.\(^\text{48}\)

Portland has long been on the list of top cities in America in numerous publications. Most of these publications cite the waterfront as one of the reasons the city ranks so high. It can be argued that this waterfront, although maybe not the main driver for urban development in Portland, has increased the desire for new development in today’s age. The park is and has always been a popular spot for tourists and residents alike, and this spot is a prime location for the people downtown to have lunch during the week or casually stroll through during the weekend. It is hard to imagine what these cities would be like if these greenspaces went unimagined. However, if one were to look at a similar city with no waterfront and compare the development, it is easy to see the need for natural greenspace. Using Hartford CT as an example yet again, one can see just how important the waterfront is to Portland. In Hartford, the Connecticut River is cut off from the downtown by Interstate 91. The downtown neighborhood in Hartford is only utilized from nine a.m. to five p.m. Monday to Friday. There has been little to no development in the area since an urban renewal project in the 1960s (Constitution Plaza) consisting mostly of government offices and insurance companies, which has since failed, and fell into the 9-5 rut. If Hartford had access to its waterfront, the development would increase, and the community would once again be vibrant. This is proven in Hartford by the creation of the Riverfront Plaza. This tiny, 500-foot long stage and seating area was created to give the people access to the Connecticut River. With the completion of this small area, the surrounding area immediately began to develop. The Connecticut Convention Center and the Connecticut Science Center were built next door, connecting to the highway overpass which connects

\(^{48}\) (Prosper Portland: URA Plan)
the plaza with the rest of the downtown. If Portland had not removed Harbor Drive, and instead had a few pedestrian bridges crossing the freeway to get to the water, the city today would be extremely different.

Figure 6: Portland Riverside 1970s
3.4 Waterfront Park: Charleston, SC

Another case study for greenspaces in urban renewal is Charleston’s Waterfront Park. This area of downtown Charleston was originally home to the city’s main dock area, being situated on the southernmost tip of land in Charleston Harbor. Just like Pittsburgh, this area saw a long, slow period of decline due to changes in shipping techniques. By the 1980s, the area was almost completely abandoned, with the only tenants being gravel parking lots. In 1975, Charleston’s new mayor started making plans for a greenspace by the waterfront to enrich the dilapidated area. The land was purchased in 1979, but the site did not break ground until 1988 due to environmental issues, the site previously being a more industrial area. The park was then opened in 1990.\textsuperscript{49} Since the opening of the park, development of the adjacent French Quarter (the location of the original walled city of Charleston) has been booming, and the city itself is seeing an increase in neighborhood use. It is no surprise that Bubba Gump Shrimp Company opened a location in the French Quarter.

\textsuperscript{49} (City of Charleston: Waterfront Park)
quarter shortly after the company was created. It is also no surprise that in 2010, Carnival Cruise Lines announced that Charleston would become the official home port of the Carnival Fantasy (now replaced by the Carnival Ecstasy), since the first thing you see when you step out of the cruise ship terminal is Waterfront Park.

Not only did Waterfront Park help revitalize the area immediately surrounding it, but it also helped the city as a whole. The boom in development in the 1990s due to the success of the park included a new soccer team and stadium, a new minor league baseball team and stadium, the opening of the North Charleston Coliseum and the South Carolina Aquarium. It also included the creation of the Charleston Area Regional Transportation Authority and the *Charleston City Paper*. All of this growth was before the turn of the Century. After 2000, the city has continued to grow. With the creation of new events, such as the Charleston Comedy Festival (2004), and the continued development of the area with the opening of the Old Slave Mart Museum in 2007 and the TD Arena in 2008, Downtown Charleston is a thriving urban area today.\(^{50}\)

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\(^{50}\) (Sasaki Associates)
3.5 State Route 99: Seattle, WA

Much like Hartford, Portland, and so many other cities, when it came time to design the highway system in the United States, the people in charge in Washington State planned to use the new highway to protect the city from flooding by using the road as a seawall against the waterfront. This phenomenon was thought to be a smart way to accomplish two things at once, bringing people through the city while protecting it from natural disasters. However, it has been proven time and time again that cutting off a city from its waterfront is not such a good idea. Then, with the introduction towards the end of the 20th century of “Green” building, sustainability, and New Urbanism, cities became more aware of the damage that cutting off bodies of water can do to a city. In Seattle, this change of heart can clearly be seen through the demolition and replacement of the Alaskan Way Viaduct, which carried State Route 99 through downtown.
Like most highway projects in the United States, the Alaskan Way viaduct was conceived in the early part of the 20th century, while the automobile started to gain ground and freeways were all the rage. Then, with the implementation of the Federal Highway Act of 1944 and Eisenhower’s Interstate Highway System, the Alaskan Way Viaduct could become a federally funded reality. From 1949 to 1966, the Viaduct underwent various
stages of construction. The first stage to open to the public began receiving traffic in 1953.\textsuperscript{51} This viaduct was thought to be working just fine for the People of Seattle until the Nisqually Earthquake damaged the viaduct 2001. Thus began discussions of what to do with the failing structure. In 2009, a plan was created by the governments of the City of Seattle, Kings County, and the State of Washington to replace the viaduct with a tunnel, subsequently opening up the waterfront for new development. A design competition was held, and one year later, James Corner Field Operations won the honor to design Seattle’s new waterfront. Throughout the next ten years, Seattle City council and Seattle residents both pass votes allowing the progression of the new waterfront. During this time, in 2013, the tunnel boring process begins. The tunnel is then completed and opened to the public in 2019.\textsuperscript{52} This new waterfront development is slated to now be complete by 2023.

With the success of the SR99 Tunnel (it has boasted over one million trips per month\textsuperscript{53}), one might wonder why moving I-91 underground is not an option for this Master Plan. The simple explanation can be narrowed down to cost. A tunnel is no easy task, and can get quite expensive, as the Hartford area already knows, currently digging a ten-mile auxiliary tunnel for storm sewers. But in the case of the 1.7-mile SR 99 tunnel, which cost approximately 1.3 billion dollars\textsuperscript{54}, one can see that a similar project in Hartford is unlikely. The State of Connecticut’s transportation budget is strained enough as is. In the scope of this Master Plan, where three miles of the existing Interstate 91 is being removed, that number from Seattle’s endeavors would at least double.

The success of the SR99 tunnel to open up Seattle’s waterfront further illustrates the point made in this thesis that people are drawn to water. If waterfronts are available, people want to be a part of them. Whether it is in the form of a park system, dining areas, residential balconies overlooking the vistas, humans have a necessitated need to be near water, and when the opportunity presents itself, people will jump at the chance. The people of Seattle spoke through their votes, and those votes said “give us access to our waterfront.”

\textsuperscript{51} (Historic American Engineering Record)
\textsuperscript{52} (Seattle Magazine)
\textsuperscript{53} (ENR Northwest)
\textsuperscript{54} (ibid)
3.6 Gateway Arch National Park: St. Louis, MO

St. Louis’ famed Gateway Arch has long been in competition with the Interstate System. Since its conception by architect Eero Saarinen in the 1960s, the land designated for the Arch on the banks of the Mississippi River has been cut off from the rest of downtown St. Louis by Interstate 70. The land was chosen for the significance of that spot, being the starting point of the Lewis & Clark Expedition. That importance must not have crossed Engineers’ minds while they were digging a highway through the city. The Gateway Arch (and grounds) was completed in 1965, and for more than 50 years, visitors had to use stairs and crosswalks to walk from downtown over to the park.

Figure 12: Gateway Arch Before New Park Access

This all changed in 2018, with the completion and opening of the new Gateway Arch National Park and Luther Ely Square, connected by a park bridge over the sunken

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55 (National Park Service)
highway. The structure carries pedestrians from the Old Courthouse over to the rest of the National Park so people can now get the full park experience from one part of the museum to the other without having to circumnavigate around the interstate system. This clever new way of building with existing infrastructure has allowed the citizens of St. Louis and tourists alike to enjoy the Mississippi Riverfront with ease once again.

Figure 13: Gateway Arch National Park with New Accessible Walkway

At a low cost of only 33.6 million dollars,\textsuperscript{56} this method of connecting people with their waterfronts could be considered highly achievable in a place like Hartford. This could be, in fact, why it has already been done. In the late 1990s, at the tail end of the century, the City of Hartford undertook a project to connect Constitution Plaza with the Connecticut Riverfront. This new Mortensen Riverfront Plaza, spanning over the highway and dipping down to the Riverwalk below has been immensely successful in getting the citizens of Hartford back to the water. It even includes a stage and outdoor seating area, due to the slope back down to the water. However, this over and down approach is not ideal for any sort of real development being considered, and while it is a great idea for single-point

\textsuperscript{56} (St. Louis Business Journal)
access, it is difficult to implement this at other points along the three mile stretch of highway considered in this thesis. Another reason this method was not considered was the fact that this Master Plan aims to allow for green development along the riverfront, while providing better access for the vehicles traveling to and through the city.

The current path of Interstate 91 in Hartford within the three-mile focus area considered in this thesis is not such a straightforward one. Considering the Northbound lanes starting at the southernmost point of the focus area, this highway changes from “at-grade” to above-grade on three separate occasions. These instances are usually used to take the highway over existing infrastructure, such as the Conland-Whitehead Highway, the rail line that runs along the riverbanks through Hartford, and the entrance ramps from Grove Street downtown to Interstate 91 North and Interstate 84 West. The term “at-grade” is also used very loosely here, as the grade for the highway was elevated to allow for some of the infrastructure just mentioned to pass under the roadway through tunnels. Considering the Southbound lanes starting from the northernmost point of the focus area, the highway changes from “at-grade” to above-grade in a similar fashion, adding one more overpass above where the road intersects with Interstate 84, while the Northbound lanes pass under the opposing highway. As seen with the sunken highway in St, Louis, it is very difficult to provide exits and entrances in such tight conditions, with roads at grade on either side. Similarly, if there were to be more of these plazas across Interstate 91 in Hartford, the already sparse access to downtown could become non-existent. In replacing the current highway and its many curves, elevations, and depressions with an at-grade, local boulevard, the downtown grid can access this road simply by three- or four-way intersections, and there is no need for extra space for on/off ramps.

3.7 Habitable Bridge Then: Ponte Vecchio, Florence, Italy

Florence, Italy is home to many architectural wonders. A Renaissance city, Florence’s architectural style is seen through its cathedrals, civic buildings, and even its bridge. One such bridge in Ponte Vecchio (“Old Bridge” in the native Italian), a cross between engineering and architecture. This bridge spans The Arno River right in the heart of the city. It was the first bridge built in the city, hence the name. The bridge design as it stands today was built in 1345 after the original structure was washed out in a flood.
Originally, the Ponte Vecchio was home to many small stalls on the street level, intended for defensive purposes. These stalls were eventually sold to merchants and converted to storefronts for butchers and fishmongers. The runoff was so dirty, and the smell became so great, that the city rulers declared a sort of “rezoning” of the bridge, only allowing for goldsmiths and jewelers to own shops there. During the Renaissance era, in the time when the Medici family ruled Florence, the family created many new architectural opportunities for the city. One such opportunity was carried over the Arno River across the Ponte Vecchio and give the bridge the famous profile it has to this day. When the Medici created the Uffizi, a now world-famous museum that was originally the governmental offices for the city of Florence, they wanted a direct connection between their Palazzo on the other side of the Arno River to the legislative building. They intended to have a pathway that took them directly from home to work and kept them distant from the lower classes at the street level. This idea became a reality on the form of the Vasari Corridor, named for its architect. This private corridor is inaccessible from the street level of the Ponte Vecchio but is part of the architecture and the bridge’s overall urban fabric, all the same.57

Figure 14: Ponte Vecchio Today, as seen from the Uffizi Gallery

57 (Visit Florence: Ponte Vecchio)
The nature of any Medieval European city is, of course, ever-changing with the times. Though the architectural styles and buildings themselves adapt for every period, the cities’ essence rarely does. The streets are still intimate, the shops still inviting, and the infrastructure still majestic. In the case of Ponte Vecchio, this is also apparent. The original bridge structure, dating from the time of Ancient Rome, meshes perfectly with the Medieval shops and Renaissance-era colonnade to form a perfect blend of past and present. Each architectural style that came next was cautious in its implementation with the previous structures, and still allows ample sunlight, views, and space for the people who experience it. This seamless mesh is what every historic preservation activist and/or practitioner strives for in their lifetime.

Figure 15: Diagrams of Ponte Vecchio's Varying Degrees of Public Access

The architecture and program of the Ponte Vecchio is well suited for Hartford. Having a bridge with street-level access over a body of water, separated pedestrian access, and connecting the two communities together with retail is a perfect blend of exactly what Hartford needs. By adding shops and other public program in the center of a river crossing, one can draw people across the bridge who otherwise may have taken a more direct route. By separating the pedestrian pathways from the roads, one provides a safe walkable area
for people to meander and enjoy the architecture they are walking on. And having the bridge connect to the existing street grid at grade is essential for other modes of transportation, such as busses, cars, or even streetcars, to cross the water safely and efficiently.

3.8 Habitable Bridge Now: 11th Street Bridge, Washington, D.C.

The Capitol of the United States of America, Washington, D.C. has a significant amount of ground-breaking, historic architecture. In addition to its law that require all new buildings to not exceed the height of the Capitol Dome, it also has many different ways to preserve this history. That being said, Washington is not a city that is stuck in the past. With innovative new architecture in buildings such as the American Institute of Architects Headquarters, the Holocaust Memorial Museum, and countless others, you can see Washington’s forward-thinking mindset when it comes to urban design. This trend in the Capitol started with the urban layout of the city’s street grid, creating wide, axial boulevards for easy, fast access across the city. A more recent nod to its innovative nature is the 11th Street Bridge Park. The 11th Street Bridge Park is an ongoing project which started in 2014 by the architecture firm OMA, and offers green, outdoor program to the Capitol City. This bridge crosses the Anacostia River just West of the current 11th Street Bridge that carries local traffic across the River in order for them to bypass the highway traffic on the adjacent Navy Yard Bridge, which carries Interstate 695.

![Figure 16: A Rendering of the Future Bridge Park, Taken from the Website of the Architect, OMA](image)
The 11th Street Bridge Park connects the Washington Navy Yard with Anacostia Park, giving residents of both neighborhoods safe, pedestrian access across the Anacostia River. The bridge itself consists of two planes, elevating and intersecting in the center of the bridge’s span, where the planes cross and continue to provide program to the citizens of Washington. The crossing of these planes not only provide nicely elevated views of the City and its landmarks, but also creates pockets of spaces for interior and exterior program to fit into. On one side, the joint is enclosed in glass, creating a nice café space for people to sit and enjoy some nourishment over the River. On the other side, the joint is left open to the exterior, but the crossing plane creates a bandshell roof for an outdoor performance space where people can enjoy concerts and other entertainment. The Park also offers greenspace, outdoor classrooms, and pedestrian and bicycle paths, as well as lookout spots at each of the planes’ peaks. The greenspaces are a continuation of the Anacostia Riverwalk Park, meant to bring green infrastructure across the River and into the newly developed Waterfront District. The Riverwalk trails on either side of the River currently do not connect but access across the Anacostia River is available on the current 11th Street Bridge via a sidewalk. The new bridge park would be a stellar addition to the Capitol City’s rich architectural history.

Figure 17: A Diagrammatic Drawing of the Bridge's Program, Taken from the Website of the Architect, OMA.

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58 (OMA Architects: 11th Street Bridge Park)
A bridge like this could be well received in an environment like Hartford, carrying greenspace and trails over the Connecticut River to connect to the trails on the other side. However, the slope needed to achieve such a dramatic crossing of planes over the Connecticut River would not be ideal for accessibility or any type of program the bridge would create. The current bridges crossing over the Connecticut River all have a gentle slope leading to a peak of approximately 60 feet above sea level. In order to keep this height for continued access of certain vessels along the Connecticut River, the slope from bank to bank, a 200 foot shorter distance than that of the Anacostia River, would exceed well over the 1:20 (5%) slope of the 11th Street Bridge Park. However, by incorporating similar methods and ideologies, certain aspects of the green bridge can be integrated into Hartford’s environment. By having the walkways start at the Plaza level rather than the street level, there is already a height advantage. By elevating the programmatic structures, one can also then have an arc start higher and have a lower slope to achieve the same amount of clearance as the existing bridges. And by connecting the trails, park spaces, and the roadway bridge pedestrian walkways, a safe crossing can still be achieved without the need to start at the ground plane.
CHAPTER 4

SITE

4.1 History

Hartford, Connecticut was founded as a settlement in 1635 by Reverend Thomas Hooker of the First Church of Christ, John Steele, and a few other colonists from New Towne, Massachusetts (currently called Cambridge). However, the first colonists to arrive at the confluence of the Connecticut and Park Rivers were members of the Dutch West India Company, who built a fort there to protect the fur traders traveling between Nieuw Amsterdam, Boston, New Haven, and Springfield/Points North. The settlement was named Hartford in 1637, after the birthplace of one of the founders: Hertford, England.59

As one of the first colonial settlements in the United States, Hartford has a long, rich history. In 1687, the Royal Governor tried to seize the colony’s royal charter, but Captain Joseph Wadsworth managed to hide it in an oak tree. The Charter Oak Monument still stands today. The city continued to grow and became a bustling port. The oldest continuously printed newspaper in the United States, the Hartford Courant, started printing in 1764. Hartford became the co-capitol of the colony (and then the state in 1788) with the city of New Haven, and the State House was built in 1796. The Hartford Fire Insurance Company issued its first policy in 1794, cementing forevermore Hartford’s nickname as the Insurance Capitol of the World. In 1814 a large group of New England Federalists organized the Hartford Convention as a protest to the War of 1812. The War caused an economic depression that effected the shipping industry, a heavy contributor to the economic status of cities like Hartford. The oldest free public art museum in the United States, the Wadsworth Athenaeum (named after Captain Wadsworth, the man who hid the Connecticut Charter in 1687), was dedicated and opened to the public in 1844. In 1875, Hartford took on the role as sole capitol to the State of Connecticut, and the new Capitol Building was completed in 1879. The current borders of the City of Hartford came about from the secession of the towns of East and West Hartford. East Hartford became an independent town in 1783, and West Hartford became an independent town in 1854.60

59 (Encyclopedia Britannica)
60 (ibid)
The start of the Industrial Revolution in the nineteenth century saw many major industries arrive in Hartford, beginning in 1851 with Sharp’s Rifle Manufacturing Company. Then in 1855, across the Connecticut River, Samuel Colt founded the rival Colt’s Patent Firearms Manufacturing Company. Amos Whitney and Francis Pratt then started the Pratt & Whitney Machine Tool Company, a manufacturer of machine tools for sewing machines, gun-making machines, and measurement tools in 1860. Then, in 1925, the Pratt & Whitney Company entered an agreement with Frederick Rentschler. Thus, the Pratt & Whitney Aircraft Company was born, manufacturing Rentschler’s patented aircraft engine. In 1876, the Hartford Machine Screw Company was founded, with its manufacturing of the first automatic screw machine. Albert Pope, inspired by English Velocipedes (high-wheeled bicycles), decided to introduce America to his own Columbia Bicycles in 1877. With the increased demand for the automobile, and decreased demand for bicycles, in 1897 Pope Automobile Company was created. In 1908, Royal Typewriters built a factory in the Parkville section of Hartford. In 1911, Underwood Typewriters built an even larger factory in the same neighborhood.  

Figure 18: Painting of Hartford's Vibrant Waterfront in the 19th Century

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61 (Encyclopedia Britannica)
The 20th century brought more and more hardship to Hartford. Numerous floods, most notably the back-to-back floods of 1936 and 1938, cost the City of Hartford many lives, businesses, and dollars. It was then that the City decided to bury the Park River, which runs from the banks of the Connecticut River, through downtown. The two World Wars cost Hartford many citizens. Then, in 1944, the Hartford Circus Fire broke out at the site of the Ringling Brothers and Barnum & Bailey Circus Big Top north of downtown. It was the largest fire in the history of the United States. With the post-War “White Flight” in the 1950s to Hartford’s surrounding suburbs, the city began to decline economically. The Connecticut General Insurance Company (which merged with the Insurance Company of North America to become Cigna) moved to a brand new, 30.5-acre site in the nearby suburb of Bloomfield. This new, sprawled out campus was reminiscent of the American dream being achieve by numerous employees and clients. However, this move was a large blow to the city of Hartford and its economy. Along with the exodus to the suburbs, the introduction of the Dwight D. Eisenhower National Interstate Highway and Defense System to Hartford further led to the decline of the city. The 1964 elimination of one of Hartford’s only connections across the Connecticut River for local traffic, pedestrians, and bicycles to make way for an eight-lane highway crossing (with only two lanes in each direction for through travel) further cut off the citizens of East Hartford from Hartford’s downtown business district. The introduction of Interstate 91 in the 1950s along the banks of the Connecticut River (behind the seawall built by the Army Corps of Engineers after the floods of the 1930s) seemed to solidify Hartford’s fate as a city cut off from its waterfront. The creation of the Conland-Whitehead Highway Connector in 1945 above the now buried Park River made sure that the Park River would likely never again see the light of day. These highway additions to the City of Hartford drove a wedge between all of the downtown’s access points, enclosing it indefinitely. Then, in 1964, Hartford completed its first large urban renewal project, known as Constitution Plaza. The front street neighborhood was thought to be too run down for rehabilitation, and thus, the site was settled. The six megablock plaza, located one story above street level at the west end and four stories on the east end, was meant to be a corporate haven for companies looking to stay in the downtown area, as well as residences and higher education facilities. The street level was meant to house retail, restaurants, and lunch spots, along with a garage under the
plaza for the employees and residents. However, in its current state, most of the buildings on site are being used as office space by the State of Connecticut and City of Hartford, the retail plazas are mostly empty, and the walkways only see traffic mostly on Monday through Friday around lunch time. In 1975, a few blocks east of Constitution Plaza, came the Hartford Civic Center. This new arena and indoor shopping plaza helped the demise of many of Hartford’s long-standing Department Stores. The Sage-Allen Department store closed its doors for the final time in 1992, and G. Fox & Company closed its doors one year later in 1993. It is rumored that the intersection of Interstate 84 and Interstate 91, poorly located on the end of a bridge and the banks of a river, was the insistence of Beatrice Fox Auerbach, G. Fox’s then-owner, on the condition that the exits all lead out directly by her store. The economic decline of the 1980s, and the increased desire for insurance company employees to move out into the suburbs, really cemented Hartford as a city defeated. Perhaps the biggest blow to the City and its citizens, however, occurred in 1997 when the Hartford Whalers, the City’s NHL team, left for Raleigh, NC to become the Carolina Hurricanes.

Figure 19: An Aerial View of Downtown Hartford during one of the flood events that devasted the City and the Region in the 1930s
Figure 20: Construction of Interstate 91 along the Riverfront in the 1960s has already cut off the citizens from the water.

By the late 1980s and into the 1990s, there were many ideas to revitalize the City of Hartford from what it had become post-Industrial Revolution. One of the best and brightest was the revitalization of Hartford’s Riverfront, led by the non-profit Riverfront Recapture, Inc. This new plaza built in 1999, connecting Constitution Plaza with the Riverfront trails, passes over Interstate 91 and Columbus Boulevard. It then steps down to the waterside via a large seating area for events and concerts held at the Mortensen Riverfront Plaza stage below. There is also a connection from the plaza for bicyclists and pedestrians across the Founder’s Bridge to East Hartford, connecting to the riverfront there as well. Another idea to bring people back to Hartford was the construction of the Connecticut Convention Center and Marriott Hotel complex in 2005, with plaza level connections to the Riverfront Recapture initiative. In 2009, the Connecticut Science Center was built in a vacant spot between the Convention Center and the Riverfront Plaza. In the
2010s, the City of Hartford had a renewed interest in bringing back professional sports teams to the City. In 2017, Dunkin’ Donuts Park opened and the Hartford Yard Goats, the Double-A affiliate for the Colorado Rockies played their inaugural season. In 2018, a renovation effort of Hartford’s Dillion Stadium was completed, and in 2019, the Hartford Athletic Football Club played its first season at home.

Figure 21: Mortensen Riverfront Plaza Today, as seen from East Hartford

Throughout its long, interesting history, Hartford has also been the home and birthplace of many notable people. Most notable is neighbors Mark Twain and Harriet Beecher-Stowe, whose homes are both now museums and historic centers. Beecher-Stowe lived in Hartford from 1873-1896, while Mark Twain resided next door from 1874 to 1891. Other notable authors born in Hartford include Suzanne Collins, author of the Hunger Games trilogy, who was born in 1962, and Stephenie Meyer, author of the Twilight series, who was born in 1973. Banker J. P. Morgan was born in Hartford in the year 1837, and famous actress Katherine Hepburn was born in Hartford in 1907. One last notable Hartfordite is the late Frederick Law Olmsted, famous Landscape Architect born in 1822.
in Hartford. Olmsted is famous for creating natural landscapes in urban environments, such as New York’s Central Park, Boston’s Emerald Necklace park system, and Mount Royal Park in Montreal. He also had a vision for his native city, designing a park “ring system”, connecting Hartford’s Pope, Elizabeth, Keney, Riverside, and Goodwin Parks via greenways and boulevards. However, the design was never implemented, and Boston continued to be the only major New England City with an Olmsted park system. As the previous section suggests, Hartford’s history is rich in economic, cultural, and industrial matters.62

4.2 Demographics

The City of Hartford is a very diverse community. According to the United States Census Bureau, in 2010 the total population of Hartford was 124,775.63 The percent of people under the age of 18 was 24.4%, while the percent of people over the age of 65 was 10.3%. The percentage of male to female residents was 48% to 52% respectively. On the breakdown of race, The highest number was the LatinX population, at 44.3%, while the next highest was the African American population at 37.9%. The percentage of the population who were immigrants between 2013 and 2017 was 21.8% of the total population of the City of Hartford. The following charts break these numbers down into simpler terms:

Table 1: City of Hartford Census Data, 2010

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<tr>
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62 (Hartford Courant)
63 (United States Census Bureau, 2019: Quick Facts)
According to the United States Census Bureau, there were 45,822 total households in Hartford between 2013 and 2017, and the average number of people in those households was 2.54. It was also recorded that 44.3% of households speak a language other than English at home. The median household income (in 2017 dollars) was $33,841. This is in stark contrast to the median household income in the State of Connecticut, which was $74,168. The Census Bureau also reported that 30.5% of Hartford citizens were living below the poverty line. As for education, the Census Bureau reported that 72.7% of Hartford’s population over the age of 25 have earned a high school diploma, while 16.6% of the population over the age of 25 have earned a Bachelor’s Degree or higher. They also reported that the average commute time for workers over the age of 16 is 23 minutes one way.\(^\text{64}\)

Economically speaking, the Census Bureau reported that out of the population of citizens over the age of 16, 61.5% were in the civilian labor force. In 2012, the total amount of retail sales amounted to $1,813,725, while the total amount of wholesaler sales amounted to $1,317,678. The total amount of manufacturers’ shipments amounted to $207,614.\(^\text{65}\)

4.3 Site/Regional Context

The Master Planning phase of this thesis focuses mainly on the Hartford and East Hartford Riverfronts, within an area bounded by the termination of the High Occupancy Vehicle lanes of Interstate 91 North of Downtown Hartford, following the Interstate 91 Right-of-Way South to the Route 5/15 Interchange and the Charter Oak Bridge, and the Conland-Whitehead Highway Right-of-Way from the banks of the Connecticut River West to Bushnell Park. This area allows for access to the Connecticut River for residents and workers in the Downtown, Downtown North, Clay Arsenal, Sheldon/Charter Oak, and Coltsville neighborhoods. In East Hartford, the Master Plan is bound by the existing Charter Oak Bridge, Route 5/15 Right-of-Way, Interstate 84/Route 2 Interchange (Dubbed the “Mixmaster”), and Interstate 284 Right-of-Way. This allows for better access to the Connecticut River and a new waterfront district for the residents and workers in the

\(^{64}\) (United States Census Bureau, 2019: Quick Facts)  
\(^{65}\) (United States Census Bureau, 2019: Quick Facts)
Downtown neighborhood of East Hartford. The area affected by this Master Plan is currently mainly state-owned land, housing state and federal highways. In the North part of the Master Plan, some of the land is owned by the City of Hartford. This ensures that any land used by this Master Plan does not have to go through the process of Eminent Domain. In addition, this plan does not displace or disrupt any citizens of Hartford or East Hartford’s neighborhoods surrounding these areas. This also means there is very little new construction of highways, mostly renumbering of existing routes. The main construction cost of this Master Plan would be derived from the demolition of Interstate 91 along the Connecticut River. The site of the habitable bridge is bordered by the Connecticut River to the East, Constitution & Riverfront Plazas to the West, The Founder’s Bridge to the North, and a new local traffic bridge to the South, implemented in the Master Plan phase of this thesis. A site plan at the planning scale, with full outline of the Master Plan parameters and an outline of the site for the project scale, can be seen on the following page, in which the new green development are highlighted, and the extent of highway relocation is outlined.
Figure 22: Thesis Project Parameters
CHAPTER 5

DESIGN APPROACH: MASTER PLAN

5.1 Design Needs

The City of Hartford has been cut off from its waterfronts since the 1940s. The revitalization of a section of riverfront in the 1990s was such a success, it’s easy to see the need to reclaim the rest of the waterfront for the people. This plaza hold numerous free public events year-round that are usually Standing Room Only, and when the City of Hartford saw what a success the plaza was to this area of the city, they started plans for the Connecticut Convention Center (completed 2005) and the Connecticut Science Center (completed 2009). This new park system would connect several existing trails, structures, and landings that are currently spaced out along the current waterfront. It would also allow the downtown grid to extend to the waterfront and across the Connecticut River, creating new blocks of developable land and allowing for local traffic to cross the Connecticut River without having to use the highway. This new highway alignment would also allow through traffic on Interstate 91 to bypass the city and the rush hour traffic that accompanies it twice a day. This also allows for the regional highway traffic to avoid the highways altogether and use the new local bypass road to access downtown Hartford, increasing their options for where to go downtown, and reducing the rush hour traffic significantly in the process. As seen in numerous case studies above, giving citizens access to natural, public waterfronts improves a city’s value, tourism, desire, and quality of life.

5.2 Design Program

The main programmatic aspect of the Riverfront Redevelopment Master Plan is, of course, the Connecticut River, and the park it supports. The secondary program would be pedestrian and bicycle trails, along with park amenities and support spaces that are currently lacking. The current program of the separate riverfront spots includes a boathouse/catering hall, a playground, an arena and stage, a boat launch, a river cruise dock, and a low ropes course. These spots are definitely a step in the right direction, but their segregation from the city and from one another makes them harder to appreciate in full. Some future program that could be introduced could be pedestrian and bicycle
connections across the river separated from the highway bridges, local automobile traffic connections across the river, kayak/canoe storage and rental facility, Soccer fields and training grounds for Dillion Stadium, picnic/barbeque areas, and retail/restaurant space, to name a few. Another aspect of the program for the Riverfront Redevelopment Master Plan also includes the relocation and reorganization of the current highway systems away from the downtown and waterfront areas. In East Hartford, the program includes new zoning districts for mixed-use zoning and housing, new local roads, new green infrastructure along the floodplains and waterways, and a new waterfront district for housing, retail, and entertainment to reclaim the downtown for the Town of East Hartford.

5.3 Design Challenges

The site has numerous challenges, both physical and political. Being directly on the waterfront, of course, the biggest is the issue of flooding. The previous chapters on water management and mitigation help to explain ways to overcome these challenges and design a plan that puts people’s minds at ease. The use of green infrastructure in the flood plain, such as permeable surfaces, rain gardens, and marshlands can ensure that the water levels will not reach the more built-up areas of the City. The second issue is the issue of site contamination; as both the Park and Connecticut Rivers were sometimes used as industrial runoffs, the banks, riverbeds, and floodplains could need to be abated. This issue has improved over time, as the quality of the water has improved thanks to initiatives from the Connecticut River Conservancy, Riverfront Recapture, and other organizations. The third big issue is the issue of the highways. In relocating the highways, one must be sensitive to the surrounding sites and neighborhoods, and not only focused on this specific site. In order to not cut off further neighborhoods and other communities from the downtown area or the waterfront, it is sensible to use existing highway right of ways, and renumber certain routes to accommodate a new path for Interstate 91. Using a fractional portion of the existing Right-of-Way along the Connecticut River in Hartford for a local access boulevard, the traffic issue is also alleviated as much as it could be, allowing for commuters to leave the highway for through traffic and use the boulevard for better access to the entire City.

Of course, the final challenge to any Master Plan is financing. This thesis tries to be as realistic as possible, using ideas that are believed to be both achievable and cost
effective. This decision was made in order to allow for the public to see that there are cost-
effective options for a sustainable future. The reuse and renumbering of existing highways
allows for the cost to be significantly less than if the highways would require a whole new
alignment. There are also numerous incentives, grants, and finance programs given by the
federal and state governments that could be used to fund some of the more extravagant
aspects of this Master Plan.

5.4 Hartford Regional Master Plan

The design of this Master Plan is significantly impacted by the new highway
alignment through Hartford and East Hartford. Starting from the South along the current
Interstate 91 (I-91), where I-91 and Routes 5/15 (US 5/SR 15) merge together in a linear
interchange, I-91 would then follow the path of the existing US 5/SR 15 North to the
Charter Oak Bridge, and follow the bridge East across the Connecticut River, to the
interchange with US 5/SR 15 and Route 2 (SR 2). Once reaching SR 2, I-91 will then turn
North along the current SR 2, following its path to the Mixmaster interchange with
Interstate 84 (I-84). At this point, the five-way intersection of I-84 and SR2 will be
reconfigured into a new, easily accessible eight-way interchange. North of the new
interchange, I-91 will then follow the existing Right-of-Way (ROW) of the unbuilt
Interstate 284 (I-284), which was planned to start at the interchange and end a few towns
North when I-91 returns to the East banks of the Connecticut River. The highway will
follow the I-284 ROW due North until it reaches the Connecticut River, where it will be
carried across by a new bridge, spanning North/Northwest. On the other side of the River,
back in Hartford, it will then cross through land owned by the City of Hartford Public
Works and Fire Departments, connecting back to the existing I-91 in the vicinity of the
termination of the High Occupancy Vehicle (HOV) lanes and Exit 33, Jennings Road.
Along with the realignment of these roads, the demolition and removal of the Conland-
Whitehead Highway spur from I-91 to Bushnell Park in Hartford would happen
concurrently, opening up the schedule for the liberation of the Park River.
Figure 23: Map of Hartford's New Highway Alignment
The next step after the highway realignment would be to terraform the existing lands to the Master Plan specifications. That is, to transform the current landscaping and grade to a more natural state with a more gradual slope. This includes opening up the Park River from the Connecticut River to Bushnell Park, and creating the park system, greenways, floodplains, and green infrastructure needed to make the Master Plan ideas come to life. This stage of the Master Plan requires the regrading of the Park River to be able to flow out to the Connecticut River and allow access to the street level above. There would also be regrading necessary for the former location of I-91, to accommodate the difference between the existing downtown (approximately 20 feet above sea level) and the existing level of the current Riverwalk (approximately 8 feet above sea level) in a gentle slope.

With the highways in the area settled and the land forms solidified, the next piece of the Master Plan to design is the local roads. Starting at the linear interchange of I-91 and US 5/SR 15, the interchange will now include exits and entrances for the new riverfront boulevard that uses the current I-91 path to distribute local traffic. This river boulevard will follow the current path of I-91 all the way up to where I-91 reconnects with its current path, where it will utilize the current on/off ramps for the HOV lanes to create new exits and entrances for the new highway alignment. Once this new river boulevard is complete, the current East/West street grid of Downtown Hartford will be extended to meet the new boulevard. Some of these roads will cross the river boulevard and continue across the Connecticut River to connect to the current streets of East Hartford. These roads would terminate in some places along East River Drive. In other places, these streets would cross East River Drive, and connect to a new grid in the newly implemented Downtown Waterfront District. Some of the streets in the current Hartford street grid would also terminate at the new river boulevard on the Hartford side, allowing for the continuation of the grid across the Connecticut River at these points to become solely for pedestrian/bicycle use. These pedestrian bridges would also be tied in to the current and new trail network implemented in the Master Plan.

The last layer of the Master Plan consists of the pedestrian and bicycle infrastructure. Wide sidewalks and separated bike paths on these local roads, as well as safe crossings across the Connecticut River, would be implemented to bridge the urban
pedestrian infrastructure with the more rural park trail system. The current trail along the banks of the Connecticut River, carrying part of the East Coast Greenway through both Hartford and East Hartford, would stay, creating the spine from which the new trails would branch off. One such trail would follow the newly liberated Park River through Downtown Hartford to Bushnell Park, connecting with the pedestrian pathways in the Park, and rising from the River level to meet the sidewalks above.

Figure 24: Map of Hartford's New Downtown Waterfront Master Plan
With the highways, local roads, land forms, and pedestrian pathways implemented in the Master Plan, the last step is of course, to add development. The new Waterfront District on the banks of the Connecticut River in East Hartford offers new land for housing, dining, retail, entertainment, and outdoor spaces for the Town to enjoy. These developments would keep in mind the suburban nature of East Hartford, and not exceed eight stories at the waterfront. As the development moves more inland, the buildings would not exceed four to five stories. The green infrastructure filled plots along the former location of I-91 in Hartford are a perfect place for new apartments to overlook the River, or restaurants that include patio space to have people dining on the shore. Being in a more urban setting, these developments do not have as much restrictions as the suburban developments across the River. However, the designers of these developments would be asked to take into account views from the existing buildings in Downtown Hartford, as to not block current residents’ views of the Connecticut River and the new Riverfront.
CHAPTER 6

DESIGN APPROACH: HABITABLE BRIDGE

6.1 Design Needs

Hartford, Connecticut is currently speckled with tall insurance company towers and high-priced apartments and condominiums. According to done by the National Income Housing Coalition, the average rent in Hartford requires almost $17.50 and hour wages, an amount the majority of residents cannot reach. The same study reported that Connecticut as a whole is 9th in the Nation for most expensive housing market. In Hartford, the fair market rate is $1,158 a month.66

However, one thing this City is currently expanding on is its love for the Arts. The city’s numerous theaters have sold out shows constantly. There are numerous new bands, theater groups, and galleries popping up all over the city. ArtSpace Hartford, TheaterWorks, and Hartford’s Real Artways are just some of the collaborative spaces Hartford offers its artists, and yet the city could always use more. Combining the need for affordable housing with the City’s artists and the desire to have a safe pedestrian crossing over the Connecticut River, this habitable bridge can bring the people from both communities to create or experience the art together. Integrating this new artistic hub into the sculpture walk that currently sits along the banks of the Connecticut River would enhance the experience the citizens have on the waterfront trail system as well.

One thing the City of Hartford desperately needs is a full-service, fresh produce grocery store in a centralized location, easily accessible by the residents. The nearest grocery stores for most residents of Hartford are in neighboring towns. The City of Hartford has long been considered a food desert, with most of its citizens having little to no access to fresh produce, baked goods, fresh meat, and healthy food options. Giving the people access to a healthier lifestyle will, without a doubt, improve livability and morale in the downtown area. This element would give access to fresh fruits, vegetables, bread, and meats to the citizens of Downtown Hartford and the surrounding Hartford neighborhoods.

66 (Hartford Courant, 2018)
The second element the City of Hartford could use is a centralized location for a City entity to ensure a good quality of life for its citizens. A center for wellness, homelessness, and emergencies could allow all citizens of Hartford access to things to keep them healthy and safe. The City’s homeless could use the facilities to have access to food, exercise, job opportunities, and shelter during the cold winter months. Those that are more fortunate can still have access to the wellness center for exercise and could also be part of the other services in a volunteer capacity.

Along with groceries and human services, another thing the City of Hartford lacks is decent, affordable housing for its residents. As in most cities across America, many of the new housing developments are too luxurious for the average citizen, and the subsidized housing projects are crumbling from lack of maintenance or care. In order for the people of Hartford to want to live in the downtown area, there needs to be places that they can afford to live in comfortably.

Currently, Downtown Hartford also has very little retail spots. Most people are required to travel out to the suburban malls and shopping centers if they need clothes, appliances, home accessories, or any sort of toys or gadgets. By giving the citizens local access to dining and retail, one can further the quality of life in the neighborhood.

6.2 Design Program

Anchored on one side, the habitable bridge will have two programmatic elements, the first being a full-service, fresh produce grocery store. This element would give access to fresh fruits, vegetables, bread, and meats to the citizens of Downtown Hartford and the surrounding Hartford neighborhoods. The second element the City of Hartford could use is a centralized location for a City entity to ensure a good quality of life for its citizens. A center for wellness, homelessness, and emergencies could allow all citizens of Hartford access to things to keep them healthy and safe. These facilities would include a pool area, workout room, exercise classrooms, a food bank/food pantry, job office, and emergency/warming shelter.
Figure 26: Programmatic Diagram of Grocery Store Elements and Their Connections

Figure 27: Programmatic Diagram of Community Center Elements and Their Connections
In the center of the habitable bridge will be the artistic elements of the design program. One structure dedicated to performance arts, and one structure dedicated to visual arts, these two complementary elements will round out the showcase of art that the habitable bridge will provide. In the performance art part of the bridge, there will be an auditorium for the artists to showcase their work, along with the support spaces that come with it, such as lighting booth and ticket counter. There will also be dance studios and recording studios for the artists to create their work, and retail storefronts for the artists to sell their works. In the visual art part of the bridge, there will be several large gallery spaces for the artists to showcase their work, allowing for flexibility in changing exhibit pieces. There will also be studios for the artists to create their work, separated by medium, where sculpture artists have a woodshop and kiln room to produce their pieces, and photographers have dark rooms to develop their photographs. This part of the bridge will also have retail spaces for the artists to sell their work.

Figure 28: Programmatic Diagram of Arts Center Elements and Their Connections
The final programmatic element to the habitable bridge is affordable housing. Allowing for small studios above the public art spaces, these artists can have access to an affordable place to live while they create their works of art. Allowing for more diverse living options (ranging from studio space to 3 bedroom) for the more general population can mean that the citizens of Hartford can enjoy these art installations mere feet from their homes.

![Figure 29: Diagram of Residential Connections to Program](image)

As a secondary aspect, some of the public spaces in this program have a secondary function of giving the citizens local access to dining and retail. Allowing for retail spaces for the artists to sell their works can do a number of great things for the community and the economy of the City and region as a whole. Also, allowing for public dining spaces in the lobbies of these architectural structures draws people across the bridge and to these spaces for a quick bite or even a longer meal.
6.3 Design Challenges

An obvious challenge of affordable housing, which has been well documented, is the ratio of cost to affordability. Developers do not see the benefits of affordable housing because they do not make a profit since the cost of construction is too high and the rent is not enough to cover a profit. This is also a struggle for the housing projects that are subsidized or built by the government, because while they do not care about profits, most agencies also don’t have the funds and resources for construction and maintenance in the long term. This has made affordable housing a very touchy subject in both the public and private sectors. One solution to this challenge could be a Public-Private Partnership, where both parties work together to bring the best aspects of their drive for affordable housing and are not bogged down by their negative aspects.

Another challenge of this program type is the challenge of mixed-use development. It is to be sure that some residents would not like to live in the same space as an office or retail space, and the biggest complaint would probably be noise or proximity to strangers. This is a challenge that can be dealt with in the design process, but it is also a challenge...
that is more internal for people than it is a problem for the designer. Different people have different preferences of how they would like to live, and not all of them can be accommodated. Therefore, in order to keep the idea of the mixed-use program appealing, the design can offer other incentives, like proximity to downtown, views of the waterfront, or resident amenities.

Another obvious challenge for the site of the habitable bridge is the question of flooding. As state previously in this thesis, it is recommended that when building in a floodplain: don’t. However, if one does build in the floodplain, there are steps and precautions to prevent real monetary or human damage during flood events. Having very little programmatic space on the first level, with breakaway materials, can prevent the more important furnishings or equipment from being damaged. Also, elevating the bridge above the floodplain guarantees that in a flood event, the program on the bridge is safe.

One last challenge to consider while designing a habitable bridge is the question of building systems. Where do they come from, and where do they go? How does one get electricity and plumbing from the existing grid and infrastructure to the middle of a river? These are questions not easily answered if they are considered well. There is also a question of jurisdiction. Since the Connecticut River is the dividing lie between Hartford and East Hartford, it is not easy to decide which municipality provides power and water. Does one provide one while the second is provided by the other?

### 6.4 Hartford Whalers Memorial Bridge

The habitable bridge starts on the Western shores of the Connecticut River in Hartford, connecting to the existing structure of the Mortensen Riverfront Plaza. At the street level below is where the program actually starts, along with a new entrance plaza and permeable surface parking area. The first floor is divided, with the West side being used for the grocery store and service areas, and the East side allocated for the wellness center pool areas and locker rooms. On the second floor, there is again space allocated for the grocery store to the West, and the wellness center to the East on this floor houses the sports court. The third floor of this piece then allows the wellness center to open up to the entire floor, having the running track over the sports courts below to the East, and the food bank/pantry and job office on the West side. The fourth floor again houses the wellness
center across the entire floor, having the workout/machine room and exercise classrooms to the East, and a large, open emergency shelter space to the West.

Figure 31: Plan View of the Western Anchor Tower at Street Level

The fifth floor of this tower is now level with the surface of the existing Mortensen Riverfront Plaza. This plaza level becomes now the new “street level” for the rest of the tower, housing a lobby for the residential portion, as well as mail room and laundry services. This lobby will also house a lounge/bar space for residents and the public to enjoy. This new “street level” is also home to the 16-foot pedestrian walkways that make up the double helix shape of the habitable bridge. There are four arms, which cross each other twice over the water to create the double helix shape. One arm branches out from the Mortensen Riverfront Plaza, one arm branches out from the East Hartford Riverfront Condominiums, and the other two arms branch out from the new local roadway bridge that bounds the South edge of the site. On the habitable bridge at this level, there are also now two separate structures. One is dedicated to Performing Arts, and the other is dedicated to Visual Arts. The structure to the West is for Performing Arts, and includes at this level a lobby space, Stage area, under-seating storage, and studios for the performing arts. There
are two open dance studios, and two recording studios. The recording studios have offices, mixing booths, and recording booths. The structure to the East is for Visual Arts, and includes at this level a lobby space, and studio spaces for sculpture, painting, and photography/filmmography. The sculpture studio has a kiln room and clay storage, while the photography studio has several dark rooms available for developing film. There is also a woodshop for the sculpture studios to have access to a large array of power tools.

![Figure 32: Plan View of Habitable Bridge at Plaza Level](image)

The sixth level of the habitable bridge is now one level above the plaza. On the Western banks of the Connecticut River, this part of the tower touching the Mortensen Riverfront Plaza allows light down into the five levels below through the five-story lobby space of the base. The hallway is lined with studio apartments, leading to the large room on the Western side of the building that can be used for banquet and event space. On the second level of the Performing Arts Center, there is now an auditorium lobby space, the upper levels of the auditorium seating, and lighting booths, coat check rooms, and ticket sales counters for the auditorium. This level also includes retail spaces for the companies.
or individuals utilizing the performance space to sell their wares, whether it be costumes from the show, videos of their performances, etc. On the second level of the Visual Arts Center, there is a lobby space, which could also double as a gallery space, as well as several other enclosed galleries that can be reconfigured to the specifications of the shows being put on. This level also includes retail for the artists to sell their paintings, photographs, sculptures, or films.

Figure 33: Floor Plans of the Arts Center Towers at the First and Second Levels
Figure 34: Floor Plans of the Arts Center Towers at the Third and Fourth Levels

On the seventh level of the anchor tower, and the third level of the bridge structures, starts the residential portion of the towers. The anchor tower on the seventh floor has a vibrant outdoor patio space for all residents to enjoy, with some green roof spaces as well. The interior piece of this floorplate will have a footprint that will be followed from the seventh floor up to the top of the anchor tower.

The footprint of this level, and all of the following levels up to level thirteen, will consist of one row of apartments along a single-loaded corridor, with one apartment at the end of the hall. Here on the seventh floor, the tower also starts to decrease in width, leaving the exterior walls to form a 45-degree angle from floor seven up to floor fifteen. The floorplates are receded 12 feet every floor to accomplish this, giving the apartment at the end of the hallway a 12 foot by 24-foot balcony space.

A similar phenomenon occurs in the Performance Art and Visual Art Centers, where the third floor is shaped like a “V”, and the rest of the roof of the level below is a vibrant outdoor space. The Performance Art Center tower does a similar movement with
the floorplates from the third floor up to the tenth floor, with a single loaded corridor and studio apartments to one side, where the floorplate recedes every level to allow for a 12-foot by 24-foot balcony space for the apartment at the end of the hallway. The Visual Arts Center is a little shorter, using this movement from the third floor up to the eighth floor.

The top two floors of all three structures are dedicated to building systems and structural use. The fourteenth floor of the anchor tower is used for mechanical space, while the fifteenth floor is used to house the anchoring and cables for the cable-stayed bridge structure. In the Performing Arts Center, this occurs on the ninth and tenth floors, while in the Visual Arts Center, this occurs on the seventh and eighth floors.

The exterior materials of these structures follow a visual likening to any cable-stayed structure, with a solid/void relationship to allude to the arm of the cable-stayed bridge. The solid walls of the towers represent the large concrete arms of cable-stayed structures, while the glass is there to represent the void space the arm leaves while leaning toward the cables it is trying to hold up. This also allows the bases of the three structures to have completely separate, free facades to correspond with the program inside. The materials on the exterior are all earthy-looking materials, such as terracotta, stucco, and stone. The color palette is also filled with earth and green tones, to match the greenery of the new park system outside, and to negate the years of concrete and asphalt seen by the highway. These materials and colors are similarly utilized on the interior as best as possible, without using unsustainable materials that imitate these looks, such as vinyl.
Figure 35: Elevations of the Habitable Bridge and Anchor Tower

The roofs are all green roof systems, mostly sedum roofs, with certain livable roofs having larger plantings. The balconies, livable roofs, and walkways & plazas are all paved with permeable pavers, draining rainwater and runoff into the bioswales, raingardens, and marshes along the riverfront. The foundation structures utilize hempcrete wherever possible for a more sustainable material, but also for aesthetics, since this area has seen enough concrete from the highways, as previously stated. The tower structures utilize heavy timber construction wherever possible, combined with steel to create a hybrid structural system. The submerged supports for the bridge are traditional concrete piles and supports, as hempcrete cannot yet bear that kind of weight, and it is unsure whether hempcrete can keep its structural aspect when submerged in water as well. Other sustainable practices the habitable bridge uses includes high-performance HVAC systems, low voltage LED lighting, and low-flow & dual flush plumbing fixtures.
CHAPTER 7

CONCLUSION

This thesis project has proven to have been quite the undertaking. Combining the Master Plan and Habitable Bridge aspects into one project has been a lengthy process, but a process that is believed to have generated the best results for the future of Hartford, Connecticut. Given more time, there are several things this thesis has skipped over or rushed past that would be beneficial to take a closer, more in-depth look at.

First on the list would be the integration of this new waterfront park system into the current park system in Downtown Hartford. The implementation of Fredrick Law Olmstead’s Ring Park Plan that was never realized could have connected the waterfront with each and every one of Hartford’s other public parks. Not only could the parks be integrated into the Master Plan, but the existing downtown development as well. By having the new green development areas bleed further into downtown’s existing fabric, the city could have integrated better into its new, old frontier. Next would be the question of Interstate 84 through Downtown Hartford, utilizing existing plans for the highway and advancing them to further realize this thesis’ Master Plan’s purpose in reconnecting neighborhoods and natural elements. Looking into the plans to bury Interstate 84 below grade throughout the downtown area, it could easily be integrated into the new green development area as the highway is capped with a new park system. Lastly, the Master Plan could be greatly improved by looking into not only the immediate surroundings of Hartford and East Hartford, but the impacts this plan could have on the communities adjacent to these two municipalities as well. Looking into ways to tie the park system into Windsor, Glastonbury, Wethersfield, and beyond, one could truly achieve Calthorpe’s vision of the Regional City, having Hartford once again become the hub it deserves to be.

The bridge itself needs more development as well, requiring deeper insights into more sustainable building materials and practices and issues of flooding, since this bridge has side-stepped Gilbert White’s advice to not build in the flood plain. The bridge design could also benefit from a more intricate look at integrating the landscape design of the park into the bridge itself, and having the park system wind through the bridge, rather than having a disconnect of green space while the bridge only carries the trails over the River.
More research could be useful to determine the types of residents looking to live on this bridge, the types of events the bridge could hold, and the types of artists being drawn to the live/work spaces the bridge provides.

The Master Plan and the Habitable Bridge have come together in a brilliant showing of what the future of Hartford could look like, and the possibilities the City of Hartford could face in a reasonable manner. The intent of this thesis was originally be as economically as reasonable as possible, in the hopes that this could one day become a reality. However, with the introduction of the Habitable Bridge, the project became less realistic. This does not deter the fact that any of the aspects of this thesis are of the most dire need in a city like Hartford, nor does it negate the desire to see something more when looking to the City’s Riverfront. Hartford was once a rest stop, a trading post, an industrial metropolis, and a culture hub. It can become all of those things again with the right amount of care, and vision for the future. The City of Hartford has stood the test of time from the Colonial Era, to whatever the future may bring.
APPENDICES

APPENDIX A: MASTER PLAN PROCESS WORK

Figure 36: Sketch of Hartford Highways Problematic Areas

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