Planning for community resilience:

A spatial planning approach to New Orleans' Martin Luther King, Jr. Boulevard

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Abstract

Planning for community resilience:
Holistic infrastructure planning in New Orleans

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In the face of dramatic environmental and economic change, society must shift its approach to infrastructure investment. No longer can engineering and segregation of land uses and systems solve a city's problems. We must shift toward a more resilient paradigm, centered on multifunctionality, collaboration with natural systems, and equitable development. In this paper, I propose a holistic approach to neighborhood-level infrastructure planning through the concept of community resilience. This model is based on three pillars of resilience: environment, economy, and culture. I explore this concept through the development of a case study and corridor plan for Martin Luther King, Jr. Boulevard (MLK) in New Orleans. In the literature review I examined the concept of resilience, how various infrastructure systems fit into that concept, and examples of current resilient practices in both the U.S. and the Netherlands. I then examined the existing conditions in New Orleans through digital research, field research, and elite interviews. The interviews, in particular, helped me identify the key issues and appropriate solutions in my study corridor. Finally, I compiled the results of my researched into a set of recommendations in the form of a toolkit for use by the various stakeholders in the community.

To the great city of New Orleans and its inhabitants;

This place inspired me to pursue a career in urban planning and will forever be my muse.

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Preface

I first moved to New Orleans in 2010 to attend Tulane University. I arrived mere days before the fifth anniversary of Hurricane Katrina and its impact still loomed large in the city. Over the four-year period that I lived in New Orleans, I witnessed dramatic changes. For example, numerous neighborhoods transformed from desolate areas to vibrant places, full of people. At that time, the question on everyone's mind was "How do we thrive in the 21st century without losing our unique culture and way of life?" It was only a matter of months after leaving New Orleans that I realized my true calling was as an urban planner. I yearned to return to the city—to work to make it the best it could be. While life has yet to lead me back to New Orleans, I have maintained strong ties with the city. It was always clear to me that I would do my thesis research in the city that care forgot—my greatest inspiration. I hope while I cannot be there all the time, that through this thesis I can still participate in the city's discourse, and, perhaps, catalyze further positive change.

I. Introduction

Problem Statement

America's cities are facing crises on multiple fronts. Every year, climate change inflicts a greater economic and psychological toll. The out-migration of the 20th century is reversing, and cities are facing growth rates not seen in decades. Increased global connectedness and mobility threatens the existence of unique cultures. Increasing economic inequalities are allowing select people to handle these issues, while the majority of citizens become increasingly vulnerable.

The current system in unsustainable and significant changes will have to occur if the American experiment is to be preserved. In this thesis, I propose a holistic approach to neighborhood-level infrastructure planning through the concept of community resilience. This model is based on three pillars of resilience: environment, economy, and culture. Through my case study, I demonstrate how all three pillars are needed to create a resilient community.

Purpose of the Study

I will explore this concept through the development of a case study and corridor plan for Martin Luther King, Jr. Boulevard (MLK) in New Orleans. New Orleans today is tackling major issues of climate change resilience,[1] displacement,[2] and faltering economic growth. In response to these issues, among others, the City of New Orleans is focused on finding innovative solutions, such as installation of green infrastructure and expanding alternative transportation networks.[3] However, there exist many obstacles to achieving these goals. The 20th century paradigms of the car as king and of keeping out water through engineering are no longer panacea for the problems the city faces. However, major institutions, such as the state and federal bureaucracies, can be slow to adapt to this shift. Furthermore, the specter of gentrification is poorly understood but looms large in many of the city's neighborhoods. With limited resources of its own, there is a

[1] Masozera, M., Bailey, M., & Kerchner, C. (2007). Distribution of impacts of natural disasters across income groups: A case study of New Orleans. *Ecological Economics*, 63(2–3), 299–306. https://doi.org/10.1016/j.ecolecon.2006.06.013

[2] Ehrenfeucht, R., & Nelson, M. (2013). Young Professionals as Ambivalent Change Agents in New Orleans after the 2005 Hurricanes. *Urban Studies*, *50*(4), 825–841. https://doi.org/10.1177/0042098012452323

[3] City of New Orleans. (2012). *New Orleans 2030: Plan for the 21st Century*. New Orleans. Retrieved from https://www.nola.gov/city-planning/master-plan/

mismatch between what the City of New Orleans would like to do and what it can get funding to do. Even at the local level, governance issues are not always straightforward. In addition to the consolidated city-parish government, many public actors own significant portions of the public realm, including the United States Army Corps of Engineers and the Louisiana Department of Transportation and Development. Most notably, the Sewerage and Water Board of New Orleans (SWBNO) operates as an independent governmental entity—operating outside the conventional hierarchy. In a city so dependent on water management, the SWBNO wields significant power with little oversight and little accountability. Therefore, it should come as no surprise that it was a major topic of discussion in the 2017 mayoral race.[4] Despite these challenges, the city has benefitted from strong leadership and a vocal network of non-governmental organizations (NGOs) and residents, which have allowed it to pursue innovative solutions.

MLK is a representative corridor facing these issues and further serves as a national symbol due to the prominence of its namesake. Hundreds of cities throughout the United States have a street named after Martin Luther King, Jr. Often, these streets run through depressed, predominantly black neighborhoods. While this is an unsurprising location for such a street, some argue that such an important historical figure deserves a street that evokes pride in one's city and brings society a little closer to King's dream.[5] Therefore, there is no better place to explore how neighborhood improvements can improve the lives of existing residents than an MLK Blvd. in a majority-black city. I will do this by exploring how planning for infrastructure and urban design in this context can contribute to the creation of a more resilient neighborhood and city.[6]

History, Geography, Demography

New Orleans celebrates its 300th anniversary this year, having been founded in 1718 by Jean-Baptiste Le Moyne, Sieur de Bienville. It was strategically located along the Mississippi

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[4] Williams, J. (2017). New Orleans mayoral candidates tout plans for Sewerage & Water Board, NOPD at forum. *The New Orleans Advocate*, pp. 11–14. http://www.theadvocate.com/new_orleans/news/article_2b581ca2-9e81-11e7-b1c7-f3096e1867e0.html

[5] Misra, T. (2015). The Remaking of Martin Luther King Streets. *CityLab*. https://www.citylab.com/solutions/2015/11/the-remaking-of-martin-luther-king-streets/415449/

[6] Spatial planning, alone, cannot solve the issues faced by the city and its residents. The aim of this thesis is to discuss one piece of the puzzle that is the eradication of poverty and institutional racism.

River at an Indian portage connecting the river to Lake Pontchartrain. Furthermore, it is located approximately 100 miles above the river's mouth, lending it some natural protection from hurricanes and storm surges. New Orleans' location near the mouth of the Mississippi resulted in rapid economic and population growth. As such, it was one of America's largest cities in the 19th century, even becoming the country's third largest city in the 1830s. While its importance diminished after the Civil War, especially with the advent of the railroad, the city continued to grow, prosper, and serve as a major port connecting the US to international markets.

New Orleans' population peaked in 1960 with 627,525 residents.[7] As of 2017, the city's population was only 393,292[8]—63% of the peak population. As with many other legacy cities, this decline can be attributed in large part to post-WWII suburbanization. For example, the population of adjacent Jefferson Parish increased from 208,769 to 439,036 over the same time period[9]—

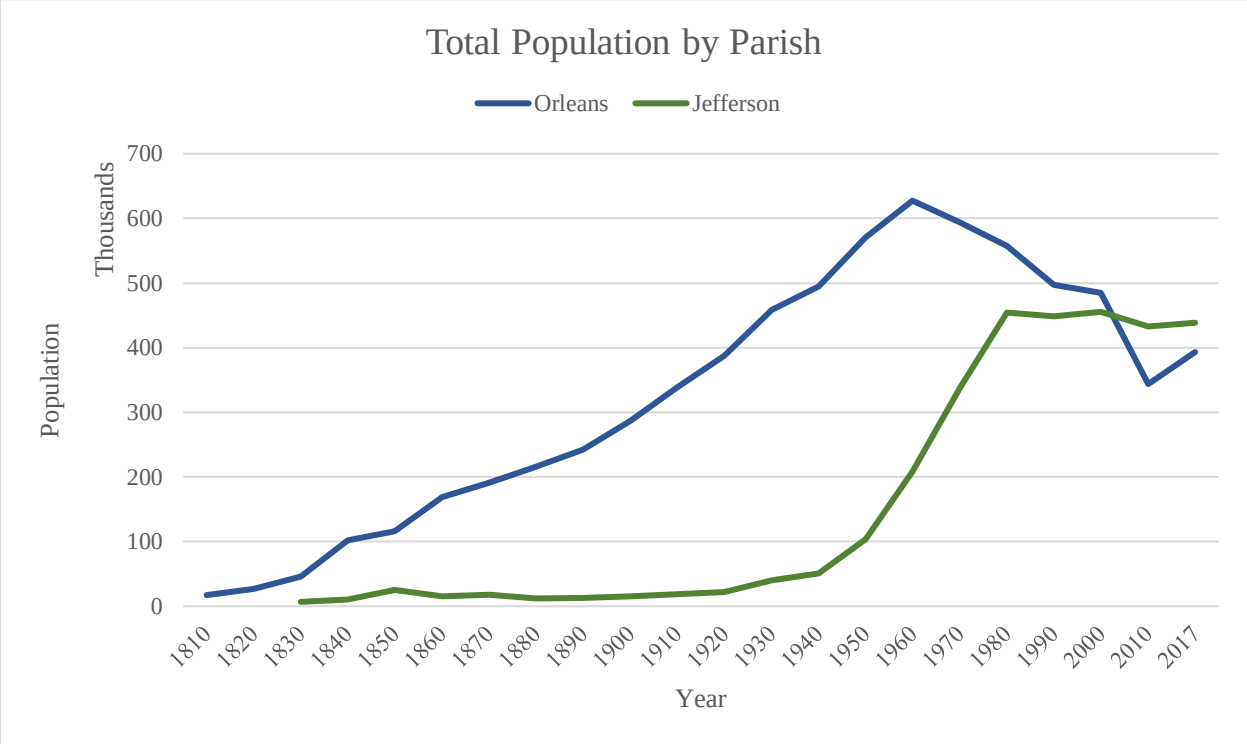

Figure I-A Population development of Orleans and Jefferson Parishes

[7] U.S. Census Bureau. https://www.census.gov/
[8] *Ibid.*
[9] *Ibid.*

making it more populous than the central city, as seen in figure I-A. Furthermore, the suburbanization of southeastern Louisiana was largely associated with white flight, while poor blacks could not afford to leave the central city. As such, blacks in 2016 constituted 60.8% of New Orleans' population,[10] while in the 1960 census, they only comprised 37.2% of the city's residents.[11] In contrast, only 25.9% of Jefferson Parish's population in 2016 was black.[12]

New Orleans also has the unfortunate fate of being located in southern Louisiana—the region of the U.S. experiencing the fastest net sea level rise. This is primarily the result of two factors: 1) sea level rise caused by climate change is exacerbated in the Gulf of Mexico due to the fact that warmer water takes up more space than colder water; and 2) channelization of the Mississippi River and other water courses has deprived wetlands of needed sediments, resulting in subsidence. Land loss and sea level rise result in a reduced barrier protecting New Orleans from hurricanes and storm surges.

Furthermore, the city's unusual geography makes it particularly prone to flooding and it relies exclusively on pumping to drain all rainwater that falls. The city is a series of natural and artificial ridges with lowlands in between. While New Orleans' early development patterns followed the high ground, improved technology and population pressures in the 20th century made possible the drainage of the swampy, low-lying areas for urban development.

Legacy City

Many American cities have a fraction of the number of residents that they had in the mid-20th century, with underutilized housing stock and other land uses. Furthermore, as these cities developed in a pre-automobile era, they are largely set up to facilitate the post-automobile era. However, legacy cities are far from empty and have become home to large populations of marginalized communities, especially African-Americans. Therefore, legacy cities are a compelling class with enormous potential to accommodate significantly larger populations in a sustainable manner. However, these cities are largely inhabited by some of our nation's most vulnerable populations.

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[10] *Ibid*.
[11] *Ibid*.
[12] *Ibid*.

Therefore, any efforts to promote growth or invest in these communities must ensure that otherwise positive changes do not occur at the expense of existing residents. While the answer to this issue has proven elusive, I believe that the development of a truly triple bottom line economy has the potential to unleash significant latent capital. However, such a transformation cannot occur with fully integrating resilience into the planning process. That is to say, both the triple bottom line and community resilience rely on a holistic framework incorporating economy, people, and the environment. Furthermore, the existence of a triple bottom line paradigm cannot survive in a capitalistic framework unless the system is designed to adapt to stressors and crises.

Research Questions

In developing my research questions, I began with two broader, more theoretical questions. Those are followed by addressing the three pillars of community resilience and their function in the context of my case study.

- What is community resilience?
- How does infrastructure planning, design, and investment influence community resilience?
- In the face of rising sea levels and more extreme weather events, how can New Orleans promote environmental resilience?
- How can New Orleans promote economic resilience in an era of extreme economic inequality?
- How can New Orleans promote cultural resilience while welcoming newcomers to the city?

Outline

From here, I begin by exploring theoretical literature regarding rights-of-way, resilience, race and equity, flood resilience, and uncertainty in planning. Then, I explore empirical literature regarding equity, flood resilience, and resilient transportation. For the final part of the literature review, I explore relevant planning documents ranging from those carrying the force of law, such as New Orleans' comprehensive plan, to visionary documents, such as the Greater New Orleans Urban Water Plan. Next, I outline my methods in three parts. First, I describe my research approach and review the related literature. Then, I describe my case selection process. Finally, I outline the specific methods used in my research. The results section begins with background research including demographics, land use, topography, and existing infrastructure. Then, I describe my field observations. Finally, I summarize the results of my stakeholder interviews. In

the discussion, I synthesize the literature review and research results to identify key infrastructure investments that will promote community resilience. Finally, I conclude by discussing the role of this thesis in the broader discussions around resilience occurring in New Orleans and the key changes that should occur in these discussions.

II. Literature Review

The purpose of the literature review is to explore work that has already been done related to my thesis. The works cited in the review serve to define concepts and illustrate current research and planning practices. This review should both support my conclusions, as well as aid in identifying gaps that can be filled by my work. The literature review is divided into three categories: theory empiricism, and practice.

Theory

The theoretical section of this literature review takes a more global look at the issues addressed in the thesis, with an aim of providing a foundation from which to build on. The concepts that I explore in this section are right-of-way, resilience, race and equity, flood resilience, and uncertainty.

Right-of-Way

City life is lived in public space, largely the streets and boulevards that compose the public right-of-way (ROW). In addition to providing a stage for Jane Jacobs' 'sidewalk ballet', ROWs serve numerous functions,[1] such as transportation,[2] commerce,[3] water drainage,[4] and conduit for utilities.[5] However, these various functions are often managed by different agencies and subject to inconsistent regulations, which can result in inefficient allocation of public resources and conflict.

Rights-of-way accommodate many uses, which often compete for space. Fragmented governance structures lead to power structures that can subordinate other, equally important, uses.

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[1] Moudon, A. V. (1991). *Public Streets for Public Use* (Morningside). New York: Columbia University Press; Rinaldi, S. M., Peerenboom, J. P., & Kelly, T. K. (2001). Identifying, Understanding, and Analyzing. *IEEE Control Systems*, *21*(6), 11–25.

[2] La Plante, J., & McCann, B. (2008). Complete streets: We can get there from here. *ITE Journal (Institute of Transportation Engineers)*, *78*(5), 24–28.

[3] Moudon, 1991

[4] Brown, R. R., Keath, N., & Wong, T. H. F. (2009). Urban water management in cities: historical, current and future regimes. *Water Science and Technology*, *59*(5), 847–855. https://doi.org/10.2166/wst.2009.029

[5] Quiroga, C., & Pina, R. (2003). Utilities in highway right-of-way: data needs and modeling. *Transportation Research Board 82nd Annual Meeting*, *1851*, 133–142. Retrieved from http://trb.metapress.com/index/5218N148P0T820X7.pdf

According to LaPlante & McCann (2008), too many streets are designed with only vehicle throughput in mind. Moudon (1991) notes that by simply changing the surface of a street one favors some over others. Unfortunately, this all too often means designing high-speed and high-capacity roads for automobiles.[6] However, the concept of complete streets aims to incorporate consideration of all modes in the planning process.[7] These modes include walking, cycling, private and commercial automobiles, and public transportation. As the automobile causes so many problems, including climate change, pollution, and traffic deaths, many planners are looking to other forms of transportation to mitigate these issues.[8]

Moudon (1991) strongly advocates for the orientation of street design towards people, not cars. The author expresses concern that "environments…can be so inhibiting as effectively to block behavior and thus can be negatively determining." This is not only the case on suburban roads, but also on urban streets redesigned to reflect that suburban ideal. The author states that "good streets are democratic streets—streets that have meaning for people, invite access for all, encourage use and participation, are loved, and are well cared for by their users." The ultimate reflection of this comes when the author follows a young girl on her unsupervised journey home from school. Through this narrative, it becomes clear why people-oriented streets are so valuable.

As an alternative to congestion-centric transportation planning, Miller *et al*. (2013) propose a framework for assessing livability indicators for transportation planning.[9] The six principles of livability they consider are: 1) transportation choice; 2) equitable, affordable housing; 3) economic competitiveness; 4) support for existing communities; 5) coordination of policies and leverage of investment; and 6) valuing communities and neighborhoods. The authors argue that while these principles are fundamental to successful transportation planning, local context means that the weight given to various indicators will vary significantly. Ultimately, "livability in transportation

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[6] LaPlante & McCann, 2008
[7] *Ibid*.
[8] Sörensen, J., Persson, A., Sternudd, C., Aspegren, H., Nilsson, J., Nordström, J., Jönsson, K., Mottaghi, M., Becker, P., Pilesjö, P., Larsson, R., Berndtsson, R., Mobini, S. (2016). Re-thinking urban flood management: Time for a regime shift. *Water*, *8*(332), 1–15. https://doi.org/10.3390/w8080332
[9] Miller, H. J., Witlox, F., & Tribby, C. P. (2013). Developing context-sensitive livability indicators for transportation planning : a measurement framework. *Journal of Transport Geography*, *26*, 51–64. https://doi.org/10.1016/j.jtrangeo.2012.08.007

is about using the quality, location, and type of transportation facilities and services available to help achieve broader community goals such as access to good jobs, affordable housing, quality schools, and safe streets." Clearly, transportation is a component of a complex urban system and this should be reflected in planning processes.

While the discussion of complete streets holds great value, indicating movement in a positive direction, the concept does not go far enough. Streets are not just conduits for transportation. In reality, streets are public rights-of-way, providing numerous services: transportation, water and sewerage services, utility corridors, and facilitation of commerce. Furthermore, this land use, which can easily account for roughly one quarter of an American city's land area,[10] provides the stage on which true public life occurs.

Resilience

It is only natural that such a major land use that is publicly owned be a focus of addressing issues of resilience within a city. The concept of resilience has emerged at the forefront of planning discussions, especially in regard to climate change. Even five years ago, climate change literature focused on reducing carbon dioxide emissions. Now, with tangible climate change impacts increasingly affecting human populations, the discussion has expanded more toward resilience to the inevitability of climate-related hazards. Contemporary applications of resilience are in such a nascent stage, however, that consensus on a definition has not been achieved.[11] Engineers define resilience as a system's resistance to disturbance and the speed at which it returns to its original state. Ecologists define it as the magnitude of the disturbance that the system can absorb before it changes its structure. Evolutionary biologists define resilience as the ability of socio-ecological systems to change, adapt, and transform in response to stresses and strains. Clearly, one's definition of resilience could either result in a reversion to a previous state or in transformation into a third state.[12] Traditional definitions may also run into issues within their consensus. Notably,

[10] Mboup, G. (2013). *Streets as Public Spaces and Drivers of Urban Prosperity*. Nairobi. https://unhabitat.org/books/streets-as-public-spaces-and-drivers-of-urban-prosperity/
[11] Trell, E.-M., Restemeyer, B., Bakema, M., & van Hoven, B. (2018). *Governing for Resilience in Vulnerable Places.* Abingdon, UK: Routledge.
[12] *Ibid*.

most definitions reflect a Western, neoliberal bias to self-reliance and individualistic thinking. The literature gives little regard for alternative forms of resilience and skirts the question of for whom the resilience serves. Furthermore, with so many ills in society, one might question whether reversion to an earlier state is really the most desirable outcome.[13]

Given the controversy of defining resilience, it should come as no surprise that uptake of the concept in planning practice has, thus far, been limited. Much of resilience planning is a response to the major errors of the waning technocratic planning regime. However, resilience planning likely is the future, so it behooves planners to make a good-faith effort to implement it as equitably as possible. As such, the concept of "community resilience" has entered the discussion. This occurs when community members are able to actively engage in building their capacity to thrive in an environment characterized by change.[14] Planners should beware of antiquated, top-down approaches to resilience planning. Instead, one must ask whom the resilience planning is intended to benefit, then integrate the ideas and priorities of community members into the process. If planners are going to shape the lives of others, they must make use of the other's lived experiences.

A disaster is defined as "a serious disruption of the functioning of a community or a society involving widespread human, material, economic, or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources".[15] Given such a definition, a hurricane hitting a city could be considered a disaster in a marginalized, black neighborhood, but not in a wealthy, white one. Therefore, planning for community resilience should incorporate two goals: 1) to create an equal share of environmental benefits and equal protection from environmental hazards among all citizens; and 2) to ensure that all citizens have equal opportunities to participate in the decision-making process in order to determine the distribution of these benefits and hazards.[16] In short, resilience for disadvantaged communities may be as

[13] *Ibid*.
[14] *Ibid*.
[15] *Ibid*.
[16] *Ibid*.

dependent on the ability to change the status quo on the actual ability to withstand external hazards.[17]

Race & Equity

Recognition of race and equity as a major force in the success or failure of cities can be traced back to Krumholz *et al*.'s seminal "Cleveland Policy Planning Report," published in 1975.[18] The authors claim that planning is an inherently political process and that the planning profession developed out of a need to advocate for the interests of a city's residents. While planning may evolve, its roots remain firmly planted. Therefore, it is only natural that in a legacy city race and equity feature prominently in every plan and political debate.

A notable example of a "legacy city" is New Orleans, which celebrates its tricentennial in 2018, and has been home to over 100,000 residents since as early as the 1830s.[19] For much of the 19th century, New Orleans was the largest U.S. city south of Baltimore. As with many legacy cities in the United States, New Orleans experienced decades of declining population in the 20th century, exacerbating poverty and resulting in a majority black population.[20] Therefore, issues of race & equity sit at the forefront of the city's political discourse. Furthermore, New Orleans is experiencing new population growth and severe effects of climate change.[21] These contemporary issues have had significant impacts on the city's marginalized communities and are changing the discussion surrounding race and equity.

As planners serve this inherent role of advocate, it is only natural that a discussion of streets named after Martin Luther King, Jr. arise. Since the 1960s, hundreds of city streets in the United States (and a few abroad) have been named after the revered civil rights leader. [22] More often than

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[17] *Ibid*.
[18] Krumholz, N., Cogger, J. M., & Linner, J. H. (1975). The Cleveland Policy Planning Report. *Journal of the American Institute of Planners*, *41*(5), 298–304.
[19] U.S. Census
[20] Mallach, A., & Brachman, L. (2016). *Regererating America's Legacy Cities*. Cambridge, MA: Lincoln Institute of Land Policy.
[21] Michael D. Blum, & Harry H. Roberts. (2009). Drowning of the Mississippi Delta due to insufficient sediment supply and global sea-level rise. *Nature Geoscience*, 2(7), 488-491.
[22] Alderman, Derek H. 2003. "Street Names and the Scaling of Memory: The Politics of Commemorating Martin Luther King, Jr within the African American Community." *Area* 35 (2): 163–73. doi:10.1111/1475-4762.00250.

not, these streets are located in marginalized, African-American neighborhoods. As such, they often serve as symbols not of the dream achieved, but the dream deferred. While the vision for what streets named after Martin Luther King, Jr. should (or already do) represent is highly controversial, they undoubtedly represent a class of neighborhoods with serious hurdles to overcome.

Flood Resilience

Pluvial flood management is a major concern in every neighborhood in New Orleans. With such immediate concerns, New Orleans is ripe for major investments in innovative drainage infrastructure. Girling and Kellett (2005) describe some basic considerations when planning for "green neighborhoods".[23] In the United States, traditional gray infrastructure generally covers 20-30% of a neighborhood's land area. These systems were largely installed in the 20th century with the sole purpose of draining stormwater (and sewage) away from the neighborhood. However, as cities become increasingly intense and complex, single-purpose infrastructure cannot sufficiently perform its function.[24] Instead, new investment should focus on multi-functional tools, such as, green stormwater infrastructure (GSI) and increasing the urban tree canopy.[25]

Implementation of innovative flood management measures achieve much more than simply minimizing risk to property-owners. Sustainable urban drainage systems (SUDS) are integral components of a triple bottom line planning approach—accounting for economy, environment, and equity.[26]

To employ "sustainable urban water management", Brown *et al*. (2009) propose an "urban water transitions framework."[27] Within this framework, New Orleans can largely be considered to be a "drained city"—a legacy of the post-WWII era. Infrastructure in such a city focuses on fast, efficient transport of stormwater out of the city to acceptable locations (Lake Pontchartrain in

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[23] Girling, C. L., & Kellett, R. (2005). Skinny Street and Green Neighborhoods: Design for Environment and Community. Washington, DC: Island Press.
[24] Girling & Kellett, 2005; Rouse, D. C. (2013). *Green Infrastructure: A Landscape Approach*. Chicago: American Planning Association; Sörensen *et al.*, 2016.
[25] Butler, D., & Davies, J. W. (2011). *Urban Drainage* (3rd ed.). Abingdon, UK: Spon Press; Girling & Kellett, 2005; Rouse, 2013; Sörensen *et al.*, 2016.
[26] Butler & Davies, 2011; Sörensen *et al.*, 2016.
[27] Brown *et al.*, 2009

the context of New Orleans). In the "drained city," water is not socially valued; instead, stormwater is piped underground to channelized waterways on the periphery.[28] However, New Orleans is tentatively moving toward the next level in the framework—the "waterways city." In such a city, residents and planners recognize the importance of wetlands and bio-filtration systems in the landscape. While gray infrastructure still plays a fundamental role, it is supplemented by strategic GSI investments that slow down and filter stormwater.[29] While advocates have championed this approach for many years and it is increasingly accepted as the future, very few contemporary cities have become "waterways cities."[30] Brown *et al*. (2009) describe their ultimate vision as the "water sensitive city." This city reflects a fundamental shift in the "hydro-social contract," with a highly flexible, evolving infrastructure system that promotes environmental sustainability, flood control, public health, quality of life, economic sustainability, climate change resilience, and heat alleviation.[31] While no U.S. city has achieved this utopian ideal, it provides a long-term goal for which to strive.

Such a shift has already occurred in the Netherlands.[32] Louisiana maintains close ties with the Netherlands, particularly due to the similar issues they face related to sea level rise and flood management.[33] As such, it is logical to draw lessons for New Orleans from the Netherlands on a variety

Figure II-A Dutch Dialogues Logo

[28] Brown *et al.*, 2009; Butler & Davies, 2011; Sörensen *et* al. 2016.
[29] Jato-Espino, D., Castillo-lopez, E., Charlesworth, S. M., & Warwick, F. (2016). Site selection for sustainable drainage in flood- sensitive highly urbanised catchments using hydrologic and geometric variables. In *Novatech* (pp. 1–4). Lyon. Retrieved from http://documents.irevues.inist.fr/bitstream/handle/2042/60370/3A74-046JAT.pdf; Sörensen *et* al. 2016.
[30] Brown *et al.*, 2009; Sörensen *et al.*, 2016.
[31] Ibid.
[32] Woltjer, J., & Al, N. (2007). Integrating Water Management and Spatial Planning: Strategies based on the Dutch experience. *Journal of the American Planning Association*, *73*(2), 211–222. https://doi.org/10.1080/01944360708976154
[33] Restemeyer, B., Brink, M. Van Den, & Woltjer, J. (2017). Between adaptability and the urge to control : making long-term water policies in the Netherlands. *Journal of Environmental Planning and Management*, *60*(5), 920–940. https://doi.org/10.1080/09640568.2016.1189403

of related issues. Booth (2011) asks why we do comparative research.[34] It is not merely the "discovery of difference between places," but a tool for finding and implementing novel solutions. Furthermore, it helps us challenge local assumptions about what planning can be or what it can accomplish. However, comparative research rarely yields one to one policy transfer. Path dependence—historical sequences of events that set in motion chains of events—results in different places exhibiting different planning cultures. However, by managing expectations, one can better adapt solutions to the context of the place receiving the new policy.

The shift in the Netherlands away from gray infrastructure has been closely tied to a strengthened relationship between water and land use planning. With the recognition of water as a legitimate land use, the discussion shifted from one simply of drainage to one centered on storage—that is to say, living with the water.[35] In fact, many Dutch municipalities now set aside 10% of their land to temporary water storage[36] and planning aims to protect citizens from floods through 2100, while remaining adaptable.[37] Instead of invoking fear, water is now central to the Dutch identity and recognized for contributing to quality of life and increased investment in communities.

Uncertainty

The embryonic state of resilience planning, especially community resilience planning, leaves major uncertainties in the planning process. Christensen (1985) describes how planning problems fall into 4 categories: 1) known technology and agreed goals; 2) unknown technology and agreed goals; 3) known technology and disagreement on goals; 4) unknown technology and disagreement on goals.[38] By identifying where a problem lies one can better direct efforts to overcome the issue. Inventiveness and creativity are key to dealing with issues in category number two. For example, most people would agree that displacement[39] of marginalized populations is not

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[34] Booth, P. (2011). Culture, planning, and path dependence : some reflections on the problems of comparison. *The Town Planning Review, 82*(1), 13–28.
[35] Restemeyer *et al*., 2017; Woltjer & Al, 2007.
[36] Woltjer & Al, 2007
[37] Restemeyer *et al*., 2017
[38] Christensen, K. S. (1985). Coping with Uncertainty in Planning. *Journal of the American Planning Association*, *51*(1), 63–73. https://doi.org/10.1080/01944368508976801
[39] Displacement can take various forms. The most common is displacement of low-income renters who cannot afford the rent increases required to stay in their homes. Low-income homeowners may experience displacement

good, but methods for improving a neighborhood while avoiding displacement have proven to be elusive. Often, problems such as poverty, displacement, and climate change resilience interact in complex ways. However, these larger problems are often broken into chunks and siloed, which may limit the ability for planning to solve problems. Furthermore, one must be careful to not prematurely "solve" a problem before it is fully understood. Abbott (2005) claims that uncertainty is a fundamental, if seemingly paradoxical, aspect of planning.[40] Without uncertainty, planning would be wholly unnecessary. Planning is, by definition, an attempt to change the future—something quite uncertain. Therefore, a solid understanding of uncertainty is crucial for guiding the planning process. As society is changing at a faster rate than ever before, uncertainty is growing, which necessitates planning. There are two types of uncertainty related to planning. Uncertainties at the outset of the planning process are known as environmental uncertainties, while uncertainty caused by the planning process is known as process uncertainty. However, uncertainty cannot merely be avoided. As systems theory outlines, one must adapt to changing conditions in order to survive.

Haughton (1999) explores the uncertainties surrounding traditional equity planning as social justice and environmental justice become increasingly interlinked.[41] How does the concept of equity play out in this new paradigm? Could a traditional view of equity—focused on transferring resources from rich to poor—fail to address the broader issues? For example, an equitable approach to pollution might be to redistribute it, however, a broader focus on justice might aim to actually reduce or prevent the pollution. In order for equity planning to be truly successful, all five types—intergenerational, intragenerational, geographical, procedural, and interspecies—must be accounted for.

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through increased property taxes. Decisions made by individual homeowners to sell their property may catalyze the greater displacement process, resulting in displacement on the community level.

[40] Abbott, J. (2005). Understanding and Managing the Unknown: The Nature of Uncertainty in Planning. *Journal of Planning Education and Research*, *24*(3), 237–251. https://doi.org/10.1177/0739456X04267710

[41] Haughton, G. (1999). Environmental Justice and the Sustainable City. *Journal of Planning Education and Research*, *18*(3), 233–243.

Empiricism

The empirical section of this literature review looks at research more closely linked to my case study. These works include such methods as ethnography and qualitative meta-analysis of infrastructure projects. The concepts that I explore in this section are equity, flood resilience, and resilient transportation.

Equity

Mere months after Hurricane Katrina ravaged New Orleans, Masozera *et al*. (2007) provided an early assessment of the divergent ability of various economic classes to cope with the disaster.[42] The authors note that U.S. disaster management historically focused on responding to disasters that recently occurred. They argue that much can be done to mitigate a disaster before it happens, however, by addressing the vulnerabilities (or resilience) of marginalized communities. While wealthier communities may sustain greater losses in a disaster, the proportional impact on their resources is generally much less than on those of marginalized populations. This was particularly evident in New Orleans, where flooding and property damage equally impacted white and black neighborhoods. Even before the storm made landfall, wealthier residents benefitted from access to cars in which they could evacuate. In contrast, low-income populations were much less likely to evacuate due to inadequate transportation access. Had the city invested more in transportation alternatives, like buses, it could have helped vulnerable populations evacuate. Similarly, poor residents were much less likely to have flood insurance. Furthermore, 82% of disaster recovery home loan applications were rejected by the Federal Government because applicants did not have high enough incomes or had poor credit ratings. While poverty is a deeply rooted problem in New Orleans, government could better facilitate the resilience of these populations. As long as the status quo is maintained, marginalized communities will struggle merely to maintain their current status in an environment dominated by changing conditions.

Ehrenfeucht & Nelson (2013) describe the paradoxes of post-Katrina recovery in New Orleans.[43] While the city had been on a long, slow decline since desegregation, the crisis precipitated

[42] Masozera *et al.*, 2007
[43] Ehrenfeucht & Nelson, 2013

by Hurricane Katrina generated significant recovery efforts. In part, this meant an influx of young professionals interested in directly participating in the city's recovery. However, this influx of wealthy residents with different cultural backgrounds served as a disruptive force in-and-of itself. New Orleans is the most rooted of any major U.S. city, with 77% of the pre-Katrina population born in Louisiana. While newcomers did place value in the local culture, there remained a disconnect between their priorities in rebuilding the city as compared to the priorities of native residents. Through qualitative research, the authors found that the newcomers largely opted to assume positions of authority within the existing power structure. If there is value in the culture and rootedness of New Orleans, clearly more must be done to bring marginalized communities into the decision-making process.

Brand (2015) explores how ideas about the meaning of "equity" can vary significantly, depending on factors, such as demographics and political ideologies.[44] Through ethnography, this study compared and contrasted perceptions of equity among various groups in post-Katrina New Orleans. Despite decades of work toward creating an equitable city, the root causes of inequity are still pervasive. In particular, the wealthy, white residents of the city view equity through a neoliberal lens. As the tax base of the city, they believe that they should receive their "fair share" through investments in their neighborhoods. While planners can choose to approach their work in a more redistributive manner more consistent with the views of the majority of the city's population, they cannot fully disentangle themselves from the capitalist state. Perhaps more successful policies would be those that build consensus from both sides of the argument.

As with traditional equity planning, Checker (2011) describes the uncertainties of traditional sustainable planning.[45] The contemporary drive for sustainable urban development in cities like New York and New Orleans disproportionately benefits big business and high-income residents. It is not a coincidence that "greening" projects occur around the same time as when gentrification takes hold. Often, the community had been calling for change for many years, but those

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[44] Brand, A. L. (2015). The Politics of Defining and Building Equity in the Twenty-First Century. *Journal of Planning Education and Research*, *35*(3), 249–264. https://doi.org/10.1177/0739456X15585001

[45] Checker, M. (2011). Wiped Out by the "Greenwave": Environmental Gentrification and the Paradoxical Politics of Urban Sustainability. *City & Society*, *23*(2), 210–229. https://doi.org/10.1111/j.1548-744X.2011.01063.x.I

calls had been unheeded. Environmental projects are often seen as politically-neutral but may not properly serve the community's needs and desires. When decisions appear to be inherently biased, it is helpful to reframe the conversation by asking whether sustainable development can occur without causing displacement.

Flood Resilience

In response to the levee failures during Hurricane Katrina, many researchers attempted to understand what may have caused the disaster. Dixon *et al*. (2006) decided to analyze subsidence rates in Greater New Orleans.[46] To accomplish this, they used images from Canada's RADARSAT satellite to measure subsidence rates from 2002 through 2005. These data indicated that the average subsidence rate in the city during that period was 5.6 mm per year, with a maximum subsidence of 29 mm per year in some areas. Based on this analysis, Dixon *et al*. suggest that the levees may have simply not been high enough. However, it likely isn't feasible to continue constructing higher walls as the land continues to shrink. Therefore, alternative methods must be employed to protect the city from flooding and storm surges.

Swart *el al*. (2014) performed an analysis of one hundred climate adaptation projects in the Netherlands in order to identify the key characteristics of such projects.[47] They ranged in scale from that of a municipal district to the provincial level. They also ranged in status from advanced planning stages to full operation. Based on their analysis, the authors identified eight common aspects of a "climate-proof project": 1) a long time frame; 2) an integrative and sustainable approach; 3) consideration of new land uses for the area; 4) a broader geographical context; 5) participation of multiple stakeholders, increasing enthusiasm, momentum, and innovation; 6) new opportunities for entrepreneurs; 7) high cost-effectiveness of projects, and not necessarily cost increases; and 8) adding "quality" to land use planning.

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[46] Timothy H. Dixon, Falk Amelung, Alessandro Ferretti, Fabrizio Novali, Fabio Rocca, Roy Dokka, Giovanni Sella, Sang-Wan Kim, Shimon Wdowinski, and Dean Whitman. "Space Geodesy: Subsidence and Flooding in New Orleans." *Nature* 441, no. 7093 (2006): 587-588.

[47] Swart, R., Sedee, A. G. J., de Pater, F., Goosen, H., Pijnappels, M., & Vellinga, P. (2014). Climate-Proofing Spatial Planning and Water Management Projects: An Analysis of 100 Local and Regional Projects in the Netherlands. *Journal of Environmental Policy & Planning*, *16*(1), 55–74. https://doi.org/10.1080/1523908X.2013.817947

1) Projects planned with traditional 10- or 20-year horizons are no longer cost-effective investments in an environment so dominated by change. Instead, 40- to 100-year horizons should be used in order to ensure durability of an investment.
2) Projects with longer horizons inherently incorporate broader objectives. The triple bottom line of people, planet, and profit becomes much more relevant in such investment decisions.
3) With longer time horizons and a triple bottom line, planning for integrated land uses becomes much more feasible. The preferred outcome shifts from an enclosed mall surrounded by surface parking to considerations of housing, green space, water management, and social cohesion. Essentially, the project is no longer an investment in a product but in a community.
4) Similarly, planners begin to recognize that a project does not exist in a closed system. Much more attention is paid to how external forces will impact the project and vice-versa. Furthermore, investments in mitigation measures outside the immediate project zone become feasible.
5) As climate-proof projects are much larger in scope in multiple dimensions, it is natural that the number of stakeholders brought to the table also increases. Such projects inherently facilitate more equitable decision-making.
6) Unsurprisingly, more resilient investments are good for business. In particular, climate-adaptation projects can facilitate the growth of recreation and tourism industries.
7) While it is extremely difficult to quantify the cost-effectiveness of investing in climate-adapted projects, those included in the analysis were not significantly more expensive than they would have been with traditional design principles. Therefore, it is reasonable to state that the durability of the projects will far outweigh any increased construction costs.
8) Finally, these climate adaptation projects improved more subjective aspects of quality of life. For example, interviewees placed more value in natural areas than the brownfield sites they replaced.

The Netherlands is widely regarded as a global leader in climate change adaptation. Given this (and the country's close ties to Louisiana), the lessons learned from the Netherlands should be

given due consideration in New Orleans. Through their analysis, Swart *et al*. (2014) provide a robust framework that can readily be transferred.

Resilient Transportation

Developing community resilience extends beyond simply mitigating a hazard, such as flooding. In addition, it involves taking a holistic look at the issues. In such an analysis, transportation plays an important role for three key reasons: 1) transportation access determines whether someone is able to evacuate in the event of a disaster; 2) transportation plays a major role in climate change; and 3) affordable transportation options allow low-income communities to access jobs and build capital, which allow them to better cope with disaster.

Dill (2009) argues that in the realm of active transportation, bicycling has the greatest potential to substitute for automobile traffic due to its speed and ability to cover distances.[48] However, the U.S. lags many European countries (such as the Netherlands) in bicycle mode share. Good bicycle infrastructure is correlated to willingness to cycle, however this preference is stronger among infrequent cyclists. Therefore, utilitarian travel, such as commuting or running errands, disproportionately relies on bicycle facilities relative to the entire street network. Study participants placed nearly equal priority on avoiding streets with a lot of vehicular traffic and minimizing trip distances. The only way to serve both of these would be to build a well-connected network. Therefore, in some cases, bicycle boulevards may be preferable to bike paths on busy roads. Clearly, consideration of bicycles is particularly important to planning for complete streets.

Bicycle infrastructure is quite advanced in the Netherlands. While their relationship with New Orleans is largely related to water, this is another area where valuable lessons may be transferred. Harms *et al*. (2016) analyzes the success of Dutch cycling and argues that public policy is crucial to increasing its mode share.[49] The two most effective policies are providing cycling infrastructure—a pull factor—and making car use less attractive—a push factor. When designing

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[48] Dill, J. (2009). Bicycling for Transportation and Health : The Role of Infrastructure. *Journal of Public Health Policy*, *30*(S1), S95–S110.

[49] Harms, L., Bertolini, L., & Brömmelstroet, M. Te. (2016). Performance of Municipal Cycling Policies in Medium-Sized Cities in the Netherlands since 2000. *Transport Reviews*, *36*(1), 134–162. https://doi.org/10.1080/01441647.2015.1059380

policies, the following should be taken into consideration: 1) Controversial policies should be implemented in stages; 2) policy should be flexible and adaptable over time; 3) policies must include both incentives and disincentives; 4) policies should integrate transport and land use planning; 5) policies should involve citizens; 6) support from higher levels of government is crucial; and 7) policies should focus on the long term and not strive for quick successes. If bicycling were to be included as a component of community resilience planning, this study could provide a solid framework.

Practice

The literature of practice section of the review includes policy documents, visions and long-range plans, guides for best practices, and narratives about planning policy and practice. This section is divided into three sections: New Orleans planning documents, best practices in the U.S., and policy and best practices in the Netherlands.

New Orleans Planning Documents

In New Orleans, the following plans guide the city's resilience planning and related policies: the City's comprehensive plan, the visionary *Urban Water Plan*, *Resilient New Orleans*, and SWBNO's *Green Infrastructure Plan*.

A Plan for the 21st Century: New Orleans 2030[50]

The City of New Orleans was well on its way to adopting a new master plan when Hurricane Katrina struck in 2005. After the storm, City officials determined that they needed an innovative document designed specifically for a post-Katrina New Orleans. As such, they scrapped the previous work and began the project anew. The City Council and Mayor finally adopted the Master Plan in 2010. This plan has been successful at setting a clear direction for the city's recovery and development. Its authors have woven together the place-based strategies highlighted here, as well as strategies for building soft community infrastructure, such as providing job training and facilitating community networks.

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[50] City of New Orleans. (2012). New Orleans 2030: Plan for the 21st Century. New Orleans. Retrieved from https://www.nola.gov/city-planning/master-plan

The Master Plan's vision is built around three pillars: livability, opportunity, and sustainability. These pillars closely align with those of community resilience: environment, economy, and culture. The plan has been recognized in the planning field for its strong emphasis on resilience, as well as equity.

The plan's vision for livability states: "In 2030 New Orleans is a city of unique historic character and ethnic and cultural diversity. The hard work of recovery and resettlement has restored the city's neighborhoods. Rehabilitated and new homes fill once empty lots in "dry" and "wet" neighborhoods alike. Known as one of America's most walkable cities, New Orleans is a place where everyone can walk to transit, shopping, and parks. Bikeways and excellent transit service offer appealing alternatives to the car." Objectives for improving the livability of the city include the following:

- Public and private improvements tailored to the character, conditions, and needs of specific neighborhoods
- A blight-eradication program, accountable to the mayor's office, coordinating all agencies and balancing enforcement and incentives to speed redevelopment
- Walkable, mixed-use corridors and commercial centers to serve neighborhoods
- Decent housing for residents of all incomes in neighborhood settings
- Preservation and enhancement of the character and quality of every neighborhood
- Broadening the historic-preservation constituency through assistance with affordable preservation and heritage trails to connect cultural history sites
- A restored canopy covering 50% of the city
- A park within walking distance of every resident
- Enhanced neutral grounds to connect the city on the model of the Lafitte Greenway

The plan's vision for sustainability states: "In 2030, New Orleans has become one of America's greenest cities: resource-efficient, environmentally healthy, and resilient. The city's building and zoning codes are national models for preservation and sustainability. The city's success has drawn new regional growth into enhanced neighborhoods…reversing regional sprawl. A global center of knowledge about managing natural and man-made systems to prevent flooding in low-lying cities, the city now boasts landscaped canals, parks with water features, and shady, tree-lined

streets that contribute to its unique beauty while reducing subsidence and managing water from storms." Objectives for improving the sustainability of the city include the following:

- Multiple-lines-of-defense strategy
- A City Office of Coastal and Environmental Affairs to coordinate strategy—including policy, mitigation, and advocacy
- A range of protection level, from a 1-in-400-year event to a 1-in-1,000-year event, as appropriate to conditions
- Exploration of polder and canal systems to manage water
- Natural drainage and stormwater-management strategies
- Regular road maintenance
- Additional transit routes in the city core
- Enhanced walkability through safe and attractive sidewalks, paths, and intersections for pedestrians
- Designated on-street and off-street bike routes for commuting and recreation
- City leadership in environmental innovation
- Urban agriculture for food security

In addition to the three pillars, the vision acknowledges as a foundational principle that a "shared destiny involves promoting equity." Two of the vision's equity objectives are 1) making strategic investments in neighborhoods according to condition and need; and 2) promoting environmental equity.

The concept of utilizing infrastructure and land use investments to promote community resilience is woven throughout most of the Master Plan's elements. The relevant policies are as follows:

Neighborhoods & Housing Element

- Goal 2. Redevelopment of blighted and vacant properties in all neighborhoods, focusing strategies to meet the respective needs of stable, recovering, and revitalizing neighborhoods.
    - Strategy 2A. Accelerate redevelopment of blighted and vacant sites through a comprehensive blight elimination program under unified management.
- Goal 3. Access to retail and services for all neighborhoods

- Strategy 3A. Revitalize existing neighborhood commercial districts and create new, walkable mixed-use districts on under-utilized commercial or industrial land.

Green Infrastructure Element

- Goal 2. Restoration and expansion of New Orleans' urban forest to reach 50% tree canopy by 2030
  - Strategy 2A. Promote tree planting on both public and private property.
  - Strategy 2B. Restore and plant new trees in parks and neutral grounds.
  - Strategy 2D. Establish stormwater management planting practices in public green spaces.
- Goal 4. A park within walking distance—approximately 1/3 mile—of every New Orleans resident
  - Strategy 4A. Balance passive and active uses of parks and public spaces
- Goal 6. More green connections throughout the city
  - Strategy 6A. Create linear parks and green ways for multi-use pathways using the city's neutral grounds and other linear connections, such as levees, canal edges, and former rail lines.
- Goal 12. Neighborhood participation in decision making about parks and recreation
  - Strategy 12B. Establish a system for community input in park and recreation design and improvements.

Community Facilities, Services, & Infrastructure Element

- Goal 1. Water, sewer, and drainage infrastructure repaired, upgraded, safe, and resilient
  - Strategy 1A. Rebuild the city's water, sewer, and drainage system to add resiliency, improve efficiency, and improve public health.

Transportation Element

- Goal 2. Integration of land-use decision making with transportation projects
  - Strategy 2C. Advance projects that enhance connectivity, reduce barriers, and improve attractiveness of neighborhoods, commercial sites, and public spaces while addressing transportation mobility.
- Goal 3. Roadways that integrate vehicle transportation with bicycling and walking

- Strategy 3D. Provide significant infrastructure investment to make major boulevards and corridors more attractive and pedestrian-friendly, particularly at transit stops.
- Strategy 3G. As part of the comprehensive bicycle plan, create a comprehensive, connected city-wide network of bike lanes, multi-use paths, and bike boulevards to safely accommodate bicyclists.

- Goal 7. Transportation infrastructure that is resilient to flooding and other natural hazards
  - Strategy 7A. Make capital investments and implement administrative strategies to ensure the resilience of the city's transportation infrastructure against future hazards.

Resilience Element

- Goal 1. A holistic community standard of resilience from flooding and other hazards
  - Strategy 1A. Create an effective community process and collaboration with the Army Corps of Engineers, regional stakeholders, and the State to have a dialogue about storm probabilities, risk, protection levels, and hazard mitigation options in order to reach a community consensus on resilience standards.
  - Strategy 1B. Advocate for a minimum 500-year flood protection level and comprehensive coastal wetlands restoration.
  - Strategy 1D. Develop a Stormwater Management Plan that will provide technical expertise, identify best management practices, and establish minimum requirements to control the adverse effects of stormwater runoff for all new development and capital improvements.
- Goal 2. A resilient city working toward a future in which evacuation would rarely be necessary
  - Strategy 2A. Create on Office of Coastal and Environmental Affairs by expanding the current agency and strengthen hazard mitigation and floodplain management capacity.

Environmental Quality Element

- Goal 1. National and international recognition of New Orleans as a leader in sustainable urbanism
  - Strategy 1B. Support and promote exemplary local sustainable practices.
- Goal 2. Citywide preparation for future climate change and reduced contribution to global warming
- Goal 3. A physical environment characterized by Smart Growth patterns of development

    - Strategy 3A. Encourage mixed-use, walkable, and bikeable neighborhoods.
    - Strategy 3B. Encourage the development and use of alternative forms of transportation.
- Goal 7. Ample opportunities for all residents to participate in and benefit from urban agriculture and community gardening
    - Strategy 7A. Support and promote urban agriculture and community gardening on public and private property.
- Goal 8. Enhancement of the environmental value of urban green spaces.
    - Strategy 8B. Incorporate the concept of the tree canopy as habitat.

Land Use Element

- Goal 1. Promote smart growth land use patterns in New Orleans and the region
    - Revitalize challenged neighborhoods with new development that contributes to character and new vitality.
    - Take advantage of vacant land on higher ground for higher density uses.
    - Promote walkable, mixed-use environments.

Greater New Orleans Urban Water Plan[51]

One of the most influential visioning documents in post-Katrina New Orleans is the Greater New Orleans Urban Water Plan, a multi-volume document intended to guide long-range planning and investments over the 50 years following its publication in 2013. Waggonner and Ball, a local architecture firm, spearheaded the 2-year-long planning process with support from Greater New Orleans, Inc., a regional economic development agency. This plan grew out of a series of conferences organized by Waggonner & Ball called the Dutch Dialogues, which brought together officials and professionals from the Netherlands and Louisiana to discuss water management.

Every 5-year flood event displaces 27,086 households in the tri-parish study area (Jefferson, Orleans, and Saint Bernard), which clearly indicates that current water management practices are insufficient. The Urban Water Plan identifies three key problems: 1) drainage systems are

[51] Waggonner, D., & Ball, M. (2013). *Greater New Orleans Urban Water Plan*. New Orleans. Retrieved from https://dl.dropboxusercontent.com/content_link/1Ahy9gKcNfTGDy9AvTdii8yJlkSSVfxyjxY2EeznYMB7XRRMmt5JfHT3wSPMfzXN/file

regularly overwhelmed by too much runoff; 2) excessive pumping causes the land to sink by lowering ground levels; and 3) critical assets are washed, hidden behind walls, buried underground, or pumped out of the city. The plan also identifies three opportunities created by shifting water management practices: 1) increased long-term safety by limiting flooding and subsidence; 2) creation of new economic development opportunities with safe, attractive waterways and water infrastructure; and 3) improvement in quality of life by integrating clean, healthy, and accessible water into public spaces and new development. The plan is driven by six guiding principles: 1) living with water; 2) slow and store; 3) circulate and recharge; 4) work with nature; 5) design for adaptation; and 6) work together.

The Urban Water Plan divides the tri-parish study area into seven areas based on urban development patterns. Central City is located in the so-called Orleans Riverside area, which encompasses the neighborhoods in Orleans Parish located on the riverside of the city's central ridge. Much of Central City, as with many Orleans Riverside neighborhoods, is built on clay soils associated with the deposition of sediment by the Mississippi River when it overflowed its banks. Unlike sand, clay soils are fine-grained and poorly drained. One of the most challenging characteristics of clay soils is their shrink-swell cycle. Clay particles have a dramatic ability to change volume as the soil becomes more or less saturated with water. Without replenishment of the water table, the particles shrink, and the land subsides. This wreaks havoc on buildings, streets, and infrastructure. As conventional drainage infrastructure is designed to move water out of an area as quickly as possible, it has a direct impact on subsidence. Furthermore, drainage canals are engineered as fixed structures and remain at their initial elevation even as the surrounding land sinks. As a result, water in many neighborhoods flows away from the drainage canals.

The Urban Water Plan has various recommendations for the Orleans Riverside area, which is characterized by tree-lined boulevards perpendicular and parallel to the river. While flooding is not severe on the backslope, that water flows into low-lying areas. As such, the plan recommends retaining water on streets and private properties on the backslope in order to slow and store the water. As the area has many vacant lots, blighted properties, highway edges, and other rights-of-way, the potential to create large water-storage areas is significant. Smaller retrofits, such as bioswales and permeable pavement can also slow and store the water that falls on the backslope.

Similar retrofits could be applied in the bowl, especially use of vacant properties, which are particularly abundant in this area. In the long-term, the wide Claiborne Avenue neutral ground should have a major canal that serves as a backbone of the system. This would allow water to circulate throughout the city and recharge the water table. Additionally, it would enable stormwater in Orleans Riverside to be pumped into the Mississippi instead of all the way to Lake Pontchartrain—a distance of over seven miles in the study area.

The Urban Water Plan identifies significant economic benefits to fully implementing the vision. Infrastructure investments would cost approximately $6.2 billion over the 50-year time horizon. However, the plan estimates that benefits from the project would equate to over $22.3 billion. The identified benefits are as follows:

- Provides multi-level protection
- Reduces flood risk
- Limits subsidence
- Reduces damages due to flooding and subsidence
- Improves insurability
- Attracts and retains businesses and investment
- Creates new industry and jobs
- Uses vacant and blighted properties
- Increases property values
- Reduces energy consumption
- Uses water to improve urban quality and value
- Increases citizen wellbeing and confidence
- Enhances water and air quality
- Reduces heat island effect
- Enriches ecosystems

As a visioning document produced by a private architecture firm, the *Urban Water Plan* does not have any legal standing. However, it has become a foundational document in the city's discussions about water management. Some of the plan's recommendations for the city's Gentilly District are under construction—touted as demonstration projects. The success of the plan has been recognized by other cities in the U.S., such as Norfolk. In response, Waggonner & Ball has

begun coordinating Dutch Dialogues and the creation of urban water plans with cities across the country. Clearly, this plan has become a seminal document in 21st century water management.

Resilient New Orleans[52]

In August 2015—10 years after Hurricane Katrina—the City of New Orleans produced *Resilient New Orleans: Strategic actions to shape our future city* as part of the Rockefeller Foundation's 100 Resilient Cities program. The document aims to combine local and global expertise and best practices to develop a framework creating a more resilient city. The plan breaks its resilience strategy into three visions: 1) adapt to thrive; 2) connect to opportunity; and 3) transform city systems.

"Adapt to Thrive" means that New Orleans must adapt to the natural environment and the impacts of climate change. In order to accomplish this, the plan sets the following goals:

- Advance coastal protection and restoration
- Invest in comprehensive and innovative water management
- Incentivize property owners to invest in risk reduction
- Create a culture of environmental awareness at every stage of life
- Commit to mitigating the city's climate impact

"Connect to Opportunity" means that the City will invest in equity. The report recognizes that resilience isn't strictly related to environmental issues. Instead, it argues that economic resilience and environmental resilience are inextricably linked. In order to make New Orleans more equitable, the plan sets the following goals:

- Invest in household financial stability
- Lower barriers to workforce participation
- Continue to promote equitable public health outcomes
- Continue to build social cohesion

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[52] Hebert, J. P. (2015). *Resilient New Orleans: Strategic actions to shape our future city*. City of New Orleans. Retrieved from www.nola.gove/resilience

- Expand access to safe and affordable housing

The vision, "Transform City Systems", largely serves to support the goals of the other two visions, while recognizing the significant institutional changes that need to occur in the City. In order to accomplish this, the plan sets the following goals:

- Redesign the regional transit systems to connect people, employment, and essential services
- Promote sustainability as a growth strategy
- Improve the redundancy and reliability of the city's energy infrastructure
- Integrate resilience-driven decision making across public agencies
- Invest in pre-disaster planning for post-disaster recovery
- Develop the preparedness of the city's businesses and neighborhoods

Resilient New Orleans successfully approaches the topic in a holistic manner. Much as with the master plan, the major pillars of this one closely aligns with those of community resilience: environment, economy, and culture. Possibly the most notable aspect of this plan is its third vision of transforming city systems. Clearly, the plan recognizes the City's historic struggles with bureaucracy, corruption, and lack of transparency. In response, it calls for a paradigm shift in how the City does business, indicating the fundamental importance of good governance in promoting resilience.

Sewerage & Water Board Green Infrastructure Plan[53]

In 2014, the Sewerage and Water Board of New Orleans adopted its *Green Infrastructure Plan*. This plan has a five-year horizon and aims to accomplish the following: 1) identify and select projects that embody the principles of living with water; 2) implement projects that comply with green infrastructure design criteria; 3) develop partnerships to implement a regional approach to green infrastructure; 4) develop community outreach programs to provide education on green

[53] Sewerage & Water Board of New Orleans. (2014). *Green Infrastructure Plan*. New Orleans. Retrieved from https://assets.documentcloud.org/documents/2511737/greeninfrastructusewerage-and-water-board-of-new.pdf

infrastructure practices and include the community in the decision making process to ensure sustainable projects; and 5) include performance measures. The SWBNO is financing the plan with $500,000 per year for the five years covered by the plan.

The plan indicates that the current drainage system can pump 29 billion gallons of water per day, which can accommodate 1 inch of rain in the first hour and ½ inch of rain in each subsequent hour. With 63 inches of rain per year, which often comes in concentrated amounts, this capacity is severely limited. Therefore, SWBNO has recognized the importance of supplementing its gray infrastructure with green. SWBNO defines green infrastructure as "systems and practices that use or mimic natural processes to infiltrate, evapotranspirate, or reuse stormwater or runoff on the site where it is generated. Green infrastructure approaches that are currently used include green roofs; trees and tree boxes; rain gardens; vegetated swales; pocket wetlands; infiltration planters; porous and permeable pavements; vegetated median strips; reforestations/revegetation; and protection and enhancement of riparian buffers and floodplains."

As this plan is functionally a pilot program, education is a major focus of the plan. It states: "the projects shall be demonstration projects composed of a single or combination of green infrastructure components from rain gardens to tree planting to bioswales, and complementing these projects that will provide education to the entire community of young and old, private citizens, professionals and commercial vendors." In order to accomplish this goal, the plan sets out project criteria based on a triple bottom line framework. The plan states that "green infrastructure projects shall be community assets."

For an agency grappling with historic lack of transparency and a byzantine bureaucracy, this plan is a breath of fresh air, indicating a certain willingness—or need—to innovate and find new ways to contend with the city's major problems. However, with the transition to a new mayoral administration, SWBNO has come under strict scrutiny and many have called for a complete overhaul of the agency. While on the broader scale these concerns are legitimate, the uncertainty has limited the agency's ability to conduct long-term planning. As SWBNO's first green infrastructure plan approaches its sunset, the political turmoil has made it unclear whether the successful program will continue into the near future.

U.S. Best Practices

In this section I look at the best practices for roadway design outlined by the National Association of Transportation Officials (NACTO).

Urban Street Design Guide[54]

The *Urban Street Design Guide* was published in 2013 by NACTO to provide an accessible guide to designing streets that meet the needs of the 21st century American city—namely safety, sustainability, resilience, multi-modalism, economic benefit, and accommodation of traffic. The guide accomplishes this with six key principles: 1) streets are public spaces; 2) great streets are economic assets; 3) streets can be altered; 4) design for safety; 5) streets are ecosystems; and 6) invest incrementally, allowing low-cost solutions to be implemented earlier. Based on the guide, MLK can best be described as a residential boulevard. Such streets are characterized by too many lanes, high-speed traffic, underutilized medians, difficult access to medians, lack of safe paths for recreational use, and variations in utilization of off-street parking. In order to improve the boulevard, the guide recommends activating the median with plantings, trees, walkways, and seating with the goal of making it a community focal point. In order to increase accessibility, it recommends curb extensions or midblock crossings. The guide also recommends taking advantage of the median by incorporating a cycle track. Such a path could drastically improve safety for cyclists. As it is a residential street, the guide recommends maintaining the curbside parking in most cases. However, blocks with underutilized parking could have curb extensions, bicycle corrals, or widened sidewalks.

Urban Street Stormwater Guide[55]

NACTO published its *Urban Street Stormwater Guide* in 2017 in recognition that integrating stormwater management and transportation is crucial to creating resilient cities. The guide argues that the approach to water must shift from contending with a problem to harnessing a resource. The guide states, "instead of competing for street space, our transportation and water

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[54] National Organization of City Transportation Officials. (2013). *Urban Street Design Guide*. Washington, DC: Island Press.
[55] National Organization of City Transportation Officials. (2017). *Urban Street Stormwater Guide*. Washington, DC: Island Press.

management agencies must work together to find value in stormwater and integrate ecology into urban life." In order to accomplish this, the guide identifies six guiding principles: 1) protect and restore natural resources; 2) promote health, equity, and human habitat; 3) design for safety and mobility; 4) design for life cycle; 5) design for resilience; and 6) optimize for performance.

Dutch Cycling Policy

In this section, I examine informational documents produced by Dutch governmental agencies outlining best practices for cycling policy. As the Dutch are global leaders in bicycle policy, their policies can be considered best practices. While U.S. have a long way to go before they will achieve these best practices, they can still learn from Dutch policy and work to incorporate these principles into their planning practices.

Cycling in the Netherlands[56]

In 2009, the Dutch government published a best-practices cycling guide to facilitate the implementation of bicycle policy in other countries. Many cities and regions in the Netherlands are regarded as leaders in bicycle mode-share and policy. The guide suggests the following policy objectives: 1) increase accessibility; 2) improve livability; 3) increase safety; 4) improve public health; 5) promote equity; and 6) reduce the number of bike thefts. While various types of policy initiatives can accomplish these goals, the key component of a successful program is better bicycle infrastructure. Such infrastructure is direct, comfortable, attractive, cohesive, and safe. Quality infrastructure improves the ability of schoolchildren, the elderly, and other vulnerable groups to incorporate bicycling into their daily lives. By further increasing the numbers of bicyclists on the roads, they become inherently safer as motorists become more accustomed to sharing the space. This increased safety creates a positive feedback loop whereby increased safety begets more bicyclists which begets increased safety. Dutch policies also recognize that a high bicycle mode-share is also good for local businesses. The guide states that while bicyclists, on average, spend less per visit to a shop, they tend to make more visits than drivers. Furthermore, less local demand for parking makes it easier for people living further afield to visit shops.

[56] Ministerie van Verkeer en Waterstaat. (2009). *Cycling in the Netherlands*.

We are Groningen[57]

The most successful cycling city in the Netherlands is Groningen. Gemeente Groningen (2015) describes how post-War Groningen was on the path to a car-centric future, however, city officials decided in the 1970s to prioritize bikes and pedestrians. Groningen now has one of the highest bicycle mode shares in the world with 60% of all trips made by bike. Key factors are the compactness of the city and its flat topography. The report claims that a bicycle is the most convenient mode of transport. The City wants to do even more for cyclists. Groningen has received much attention from foreign planners. Cycling is the cheapest (and most equitable) mode of transport.[58] It also has zero emissions, improves air quality, noise pollution, GHG emissions, and the attractiveness of the city. The City believes that bicycle facilities are important to the sustainable economic development of the city. In particular, the City focuses on separating car and cycle routes/crossings. It believes that innovative solutions are the key to success. They claim that "a bicycle is the most important mode of transport."

Gaps in the Literature Review

The literature available in the various topics I address is extensive. As the goal of the thesis is to take a holistic view of an issue, the most significant limitation of my literature review was my own capacity to adequately represent the literature relevant to all aspects of the study, especially in regard to empirical literature. Therefore, the literature review functions primarily as one contributing element to the overall research project. As is discussed in chapter III, my thesis is driven by the data, with the literature review playing a supporting role.

[57] Gemeente Groningen. (2015). *We are Groningen: Cycling City*.
[58] While walking is cheaper than cycling, it often isn't a feasible urban transport option for distances over a mile. Cycling, on the other hand, can dramatically extend the distances that a person is able to travel.

III. Methods

In this chapter I begin by reviewing the literature guiding my research methods and approach to this thesis. That is followed by a preliminary description of my case study and rationale for selecting it. Finally, I detail the actual research methods that I employed.

Research Approach

In order to address the research questions, I primarily employ grounded theory.[1] This method was formalized by Glaser and Strauss with their 1967 publication of *The Discovery of Grounded Theory*. The most fundamental aspect of this method is that it applies a rational analysis of a real-world situation. Additionally, it utilizes data in order to develop the theory. While theoretical literature is a major component of the research—providing support for the insights gained from the data—traditional theoretical frameworks do not necessarily guide or structure the analysis. While there is a heavy focus on the data, the conclusions must be abstract enough to apply to broader situations than the case studied. Using grounded theory, I will address my research questions:

- What is community resilience?
- How does infrastructure planning, design, and investment influence community resilience?
- In the face of rising sea levels and more extreme weather events, how can New Orleans promote environmental resilience?
- How can New Orleans promote economic resilience in an era of extreme economic inequality?
- How can New Orleans promote cultural resilience while welcoming newcomers to the city?

I also take inspiration from the principles of participatory action research—a type of applied research designed to find the most effective way to bring about a desired social change or to solve a practical problem, usually in collaboration with those being researched.[2] According to

[1] Bryant, Antony, and Charmaz, Kathy. *The SAGE Handbook of Grounded Theory*. London: SAGE Publications, 2007.
[2] Fals-Borda, O., & Rahman, M. A. (1991). *Action & Knowledge: Breaking the monopoly with participatory action research*. New York: The Apex Press; Trell *et al*., 2018.

Fals-Borda and Rahman (1991), the two primary goals of action research are as follows: 1) enable oppressed groups and classes to acquire sufficient creative and transforming leverage as expressed in concrete actions, struggles, and projects; and 2) produce and develop sociopolitical thought processes with which popular bases can identify. The method combines the academic knowledge of the outsider with the popular knowledge and wisdom of the internal agent through their lived experience. This combination "may result in total scientific knowledge of a revolutionary nature, which destroys the previous unjust class monopoly."[3] Participatory action research is not limited to a search for knowledge nor must it be limited to one, singular project. While true participatory action research is beyond the scope of a thesis, it is my hope that this can act as one project in a greater work that closely links the expert and the community. Fals-Borda and Rahman (1991) describe this as a *vivencia*— "a progressive evolution toward an overall, structural transformation of society and culture, a process that requires ever renewed commitment, an ethical stand, self-critique, and persistence at all levels." That is to say, the *vivencia* that is participatory action research can be considered not just a method, but a philosophy of life. Key to this philosophy is the recognition that research does not exist in a vacuum—that one must take into consideration history and preserve the existing cultural roots of a community. Such considerations are reflected in the writings of 20th century Italian philosopher, Antonio Gramsci, known for his theory of cultural hegemony, which describes how the bourgeoisie utilize cultural institutions to maintain power. In contrast to the existing cultural hegemony, the Gramscian tradition purports the intellectual abilities of every person—their ability to organically develop knowledge based in common sense and experience. To this end, Fals-Borda and Rahman (1991) claim "the experiences of Appalachia, blacks, native Americans [*sic*], ethnic minorities, and others demonstrate the existence of cultures [in the post-industrialized Western world] in which knowledge has not been fully absorbed by the dominant knowledge structures." As the culture of Central City sits squarely in this category, I believe that to transform it into a resilient community requires incorporating these principles of participatory action research into the planning process.

[3] Fals-Borda & Rahman, 1991

My research methods are consistent with the transformative worldview that I will apply to the project.[4] This philosophical worldview orients research around the lives of marginalized groups, such as urban African-Americans, who are the primary group residing along New Orleans' MLK corridor. This worldview acknowledges the persistent inequities, institutionalized racism, and oppressive power dynamics in American society. The worldview aims to give a voice to people that might otherwise not be heard. While the transformative worldview does not explicitly engender applied solutions, it lends itself to an applied research design, which does have an explicit goal of finding pragmatic solutions for concrete problems.

Case Selection

The process of site selection has largely been by personal knowledge of the area and research interests. In an era of increasing urbanization, I believe that legacy cities—cities that developed largely in the pre-WWII era—have great potential to handle much of that growth. As a result, the much-needed revitalization of legacy cities often comes with displacement of existing residents, as well as other race and social justice issues.

Few other legacy cities in the U.S. are as prone to floods as is New Orleans. Therefore, it serves as an interesting case study that can help researchers understand how legacy city and flooding issues interact. This situation has resulted in many dysfunctional rights-of-way, regularly flooded and filled with sinkholes, among other issues. However, with numerous public bodies often having jurisdiction over the same corridor, these issues can be difficult to rectify. Furthermore, subtleties, such as culture, history, and geography, can be properly incorporated into the analysis based on my personal knowledge of the city.

Within the context of New Orleans, the MLK corridor serves as a particularly interesting case study. First, its name makes it a symbol—unique from equivalent streets in the city, although it exhibits geography, demographics, land uses, and urban form typical of much of New Orleans. That is to say, it runs through a low-lying, impoverished, black residential neighborhood with a revitalizing commercial district and an underground drainage canal along its length. It differs from

[4] Creswell, J. W. (2014). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches* (4th ed.). Thousand Oaks, CA: Sage Publications.

other similar corridors in that much of the revitalization that has occurred has been driven through grassroots community efforts, somewhat buffering it from the negative effects associated with gentrification.

Research Methods

Data collection in the first phase focuses on two methods: observation and interviews. Observation includes the creation of a series of maps, with the immediate goal of developing a detailed understanding of the site. Field research took place on February 15th, 16th, and 20th, during which time the researcher walked the study corridor, observing the built, natural, and social capital. This primarily occurred through visual observation, supported by interactions with local residents and business-owners. The route I took was a circuitous one that involved walking every block face of the square blocks lining MLK. This allowed me to make observations immediately along MLK, but also in the immediately surrounding streets. Both Jacobs[5] and Wolfe[6] expound the benefits of systematically walking an area to perform detailed observation and gain insight into its functions. Wolfe (2016) calls this "urban diaries" and especially promotes the use of a camera to record observations. Some of the key aspects of the neighborhood I looked for were building use and condition; land use and condition; special-purpose buildings, such as churches and schools; common activities of residents; condition of infrastructure, such as sidewalks and drainage; existence of trees and quality of greenspace; and direction of change in urban form and population.[7]

Unfortunately, the scope of the project does not allow for a full community outreach program. However, "elite interviews" with key stakeholders knowledgeable about the issues provide similar insights in a more consolidated manner.[8] I selected potential interviewees based on their ability to provide unique perspectives on the issues.[9] Not all voices were included due to the limited time period I had available to conduct the interviews. Notably, I was unable to schedule

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[5] Jacobs, A. B. (1985) *Looking at Cities*. Cambridge, Mass.: Harvard University Press.
[6] Wolfe, C. R. (2016). Seeing the Better City: How to Explore, Observe, & Improve Urban Space. Washington, DC: Island Press.
[7] Jacobs (1985)
[8] Harvey, W. (2011). Strategies for Conducting Elite Interviews. *Qualitative Research*, *11*(4), 431–441.
[9] Harvey, 2011; Restemeyer *et al*., 2017.
All work conducted with human subjects was approved by the University of Washington's Institutional Review Board. All information presented in this document adheres to the terms agreed to by each individual subject.

meetings with any City staffers. Despite these difficulties, the interviews that were conducted included a diverse range of community and professional voices. I conducted in-person interviews on March 20th-22nd, each lasting roughly 30 to 60 minutes, with the following individuals at locations of their choosing:

- Jay H. Banks, New Orleans City Councilmember[10] for District B
    - Mr. Banks has been an influential member of the New Orleans community for many years, having served numerous charitable and political organizations. Mr. Banks was elected to the City Council on November 18, 2017 and sworn in on May 7, 2018. District B encompasses many neighborhoods, including the entire length of MLK.
- Dan Favre, Executive Director, Bike Easy
    - Bike Easy is New Orleans' bicycle education and advocacy organization. It aims to promote active transportation and make transportation more equitable. Bike Easy's office is located in Central City.
- John Kleinschmidt & Andrew Sternad, Design Associates at Waggonner & Ball Architects
    - Waggonner & Ball was founded in New Orleans in 1989 and provides architecture, planning, and urban design services. In the post-Katrina era, the firm has focused its efforts on remaking New Orleans into a more sustainable city, especially through its *Dutch Dialogues* and *Greater New Orleans Urban Water Plan*.
- Alexandra Miller, Principal Planner, Asakura Robinson
    - Asakura Robinson is a Houston-based urban planning, design, and architecture firm. Its New Orleans office is located in Central City and focuses on inclusive, equitable economic development and community revitalization.

[10] Mr. Banks was still a councilmember-elect at the time of the interview, but for consistency I refer to him as a councilmember.

- Alicia Neal, Executive Director, Groundwork New Orleans
    - Groundwork New Orleans is part of a national network of organizations committed to improving the natural and built environments of disadvantaged urban communities. The organization has built many green stormwater infrastructure projects near the MLK corridor, largely through the engagement and training of local youth.
- Alex Posorske, Executive Director, Ride New Orleans
    - Ride New Orleans is a public transit advocacy organization committed to creating an equitable, world class public transportation system in Greater New Orleans. Ride's office is located in Central City.

These interviews consisted of a series of questions about the issues facing the MLK corridor and wider community, about the needs of users of the right-of-way, about the potential implications of changes, and about how they envision the concept of resilience. The literature review and initial field observations supported the development of the interview questions. Most questions remained consistent for each interview so that the answers could be readily comparable. However, certain questions were tailored to each interviewee and evolved over the course of the interview. The standard questions asked were as follows:

- Briefly describe the mission of your organization and the work it does, especially as it relates to Central City and the concept of resilience.
- What do you see as the most pressing issues in the Central City neighborhood?
- What are Central City's greatest assets?
- What are the biggest issues specifically along the MLK corridor?
- What are the greatest assets of MLK?
- How would you define "resilience"?
- How would you define "community resilience"?
- How severe is flooding along the corridor and how might that be improved?
- What transportation issues exist in the corridor and how might they be improved?
- What issues and solutions might you suggest for other right-of-way services, such as utilities and greenspace?

- What is the current threat of displacement along the corridor and how might that change as a result of infrastructure improvements?
- How might you apply solutions to the corridor's issues in an equitable manner?
- How could land use planning and regulation play a role?
- What cultural uses and associations should be considered when planning interventions in the MLK corridor?
- Are the any variations along the corridor that might necessitate different interventions?
- Based on our discussion, what do you believe are the key interventions along the corridor that will promote community resilience?
- How could this project best serve the mission of your organization and the New Orleans community?

This exploratory phase also included some supportive research through the collection of demographic data from the U.S. Census Bureau and land use and right-of-way data from the City of New Orleans.[11] An ArcGIS database was created that includes the data from the Census Bureau and the City, as well as data and observations from the field research. For the purposes of this project, I define the "corridor" as all blocks situated directly along Martin Luther King, Jr. Boulevard, as shown in figure III-A. However, I define the "study area" as the 13 census tracts within 1/8th of a mile of the "corridor", which roughly corresponds to neighborhoods in the immediate surroundings. These are tracts 69, 70, 72, 78, 84, 85, 86, 94, 103, 123, 124, 139, and 140.

Phase two began with a detailed inventory of all existing uses of the right-of-way, primarily through the analysis of planning and engineering documents produced by the City and other agencies. Data from the interviews will be coded in order to identify priorities. I reviewed accepted industry standards using documents produced by NACTO and other planning organizations. Based on analysis of the various data sets, a toolkit was developed that incorporates the identified needs of the community, existing limitations, and available resources.

[11] City of New Orleans. *Open Data*. http://portal-nolagis.opendata.arcgis.com/

An analysis of the MLK corridor in New Orleans also serves as a relevant case study related to governance and design of complex rights-of-way in places that face major environmental and social issues.

Figure III-A Study Area Context Map

IV. Results

This chapter outlines the data I gathered in my research. First, I look at demographics, land use, and topography within the study area, using GIS and other digital tools. Then, I provide information on existing infrastructure systems in the study area and the entities that operate and maintain them. Next, I describe the observations I made in the field. For this field work, I focused on land use, right-of-way and infrastructure, intersecting corridors, and people and culture. Finally, I outline the data I gathered from the interviews I conducted.

Demographics[1]

The resident population of the study area is 21,181—5.5% of New Orleans' total population of 382,922. Greater New Orleans (GNO) is home to 1,250,247 people and Louisiana, 4,645,670.

Black and African-Americans are overrepresented in the study area, comprising 67.8% of the study area population. In contrast, New Orleans is 59.8% black; GNO, 34.9%; and Louisiana, 32.2%. Within the study area, the proportion of black residents varies significantly, as shown in figure IV-A. The highest percentage is in tract 69, with 98.2% of the population, which includes the Marrero Commons Hope VI project. In contrast, blacks constituted only 12.0% of tract 78, which is part of the Lower Garden District and the portion of the study area with the highest elevation.

[1] U.S. Census

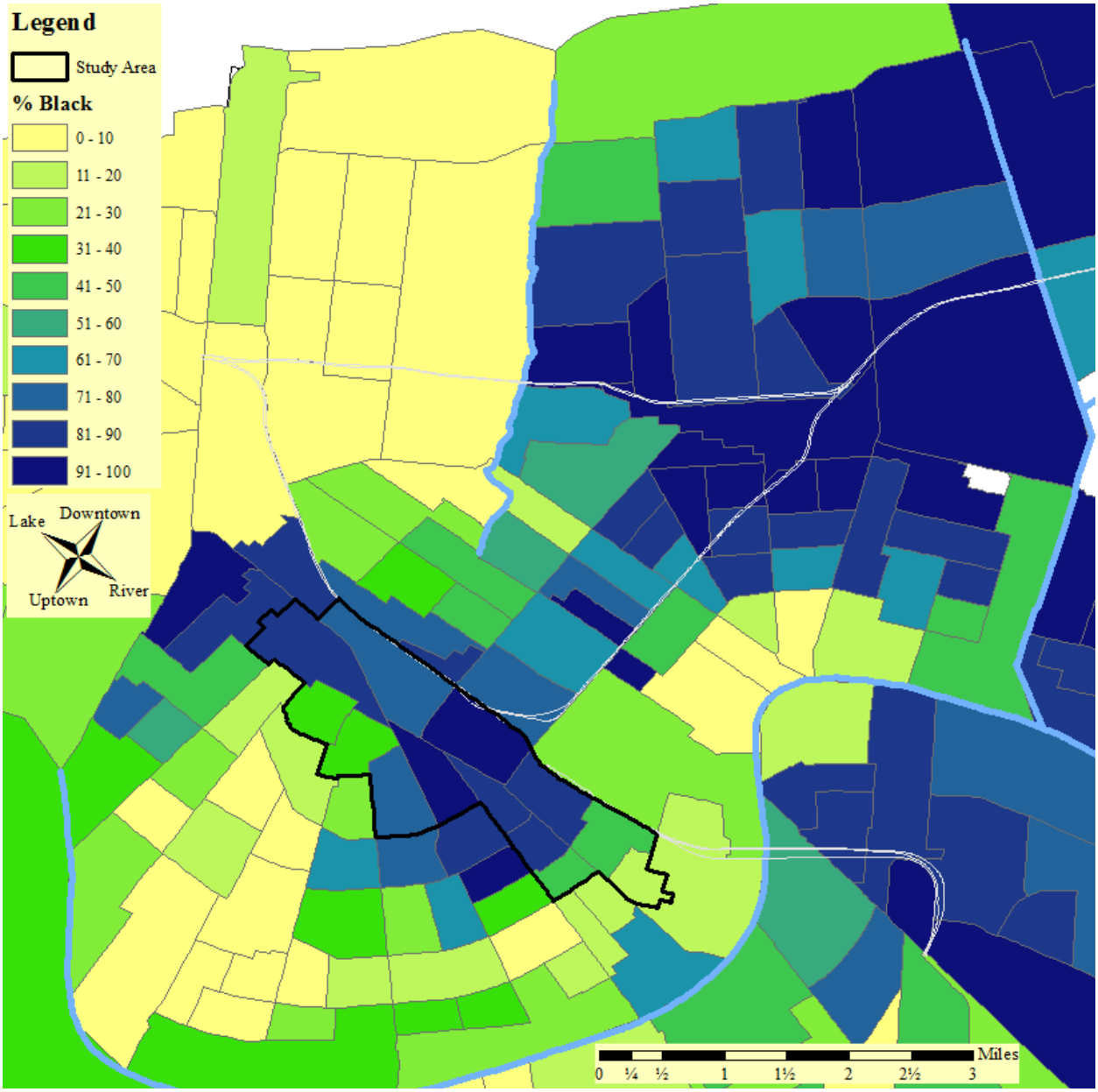

Figure IV-A % Black Population by Census Tract

Strikingly, the portion of study area residents living below the poverty level was 40.1%. In contrast, 26.2% of all New Orleanians, 18.2% of the population in GNO, and 19.7% of Louisianans were living in poverty. As shown in figure IV-B, the highest percentage was tract 140, with 65.9%, which includes the Guste Homes Hope VI project and the associated tower housing seniors. The lowest percentage was tract 123, with 15.3%, which corresponds to a portion of the Broadmoor neighborhood.

Similarly, per capita income in the study area was lower, at $21,182. That of New Orleans was $28,444; GNO, $28,349; and Louisiana, $25,515. As shown in figure IV-C, the lowest per

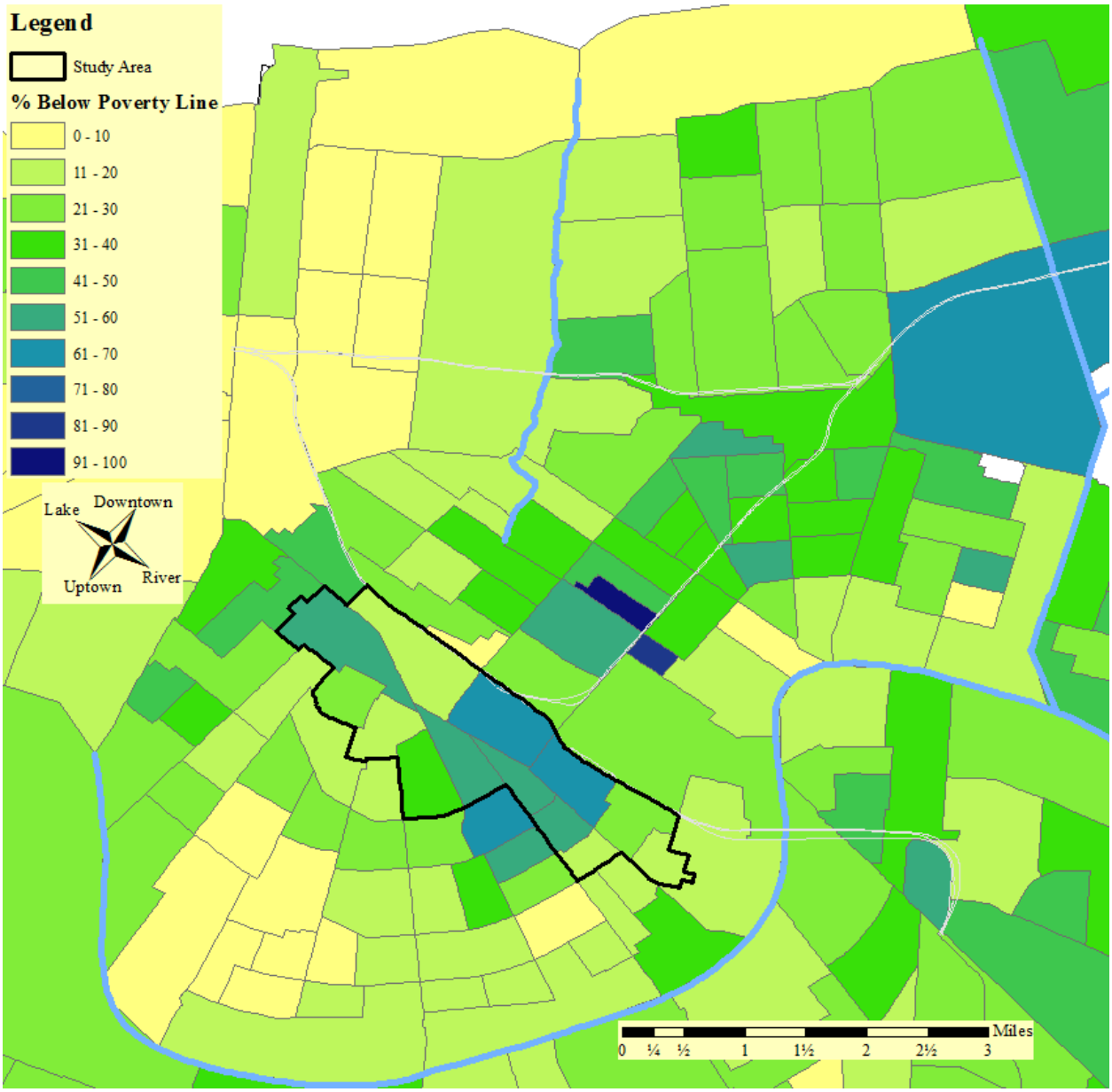

Figure IV-B % Population Below Poverty Line by Census Tract

capita income was in tract 70, at $5,032, however this may be partly a result of the large student population due to the presence of Xavier University. Much as tract 78 had the fewest black residents, it also had the highest per capita income at $50,419.

Clearly, the racial and economic disparities in the study area are stark—highlighting the severity of the issues facing New Orleans.

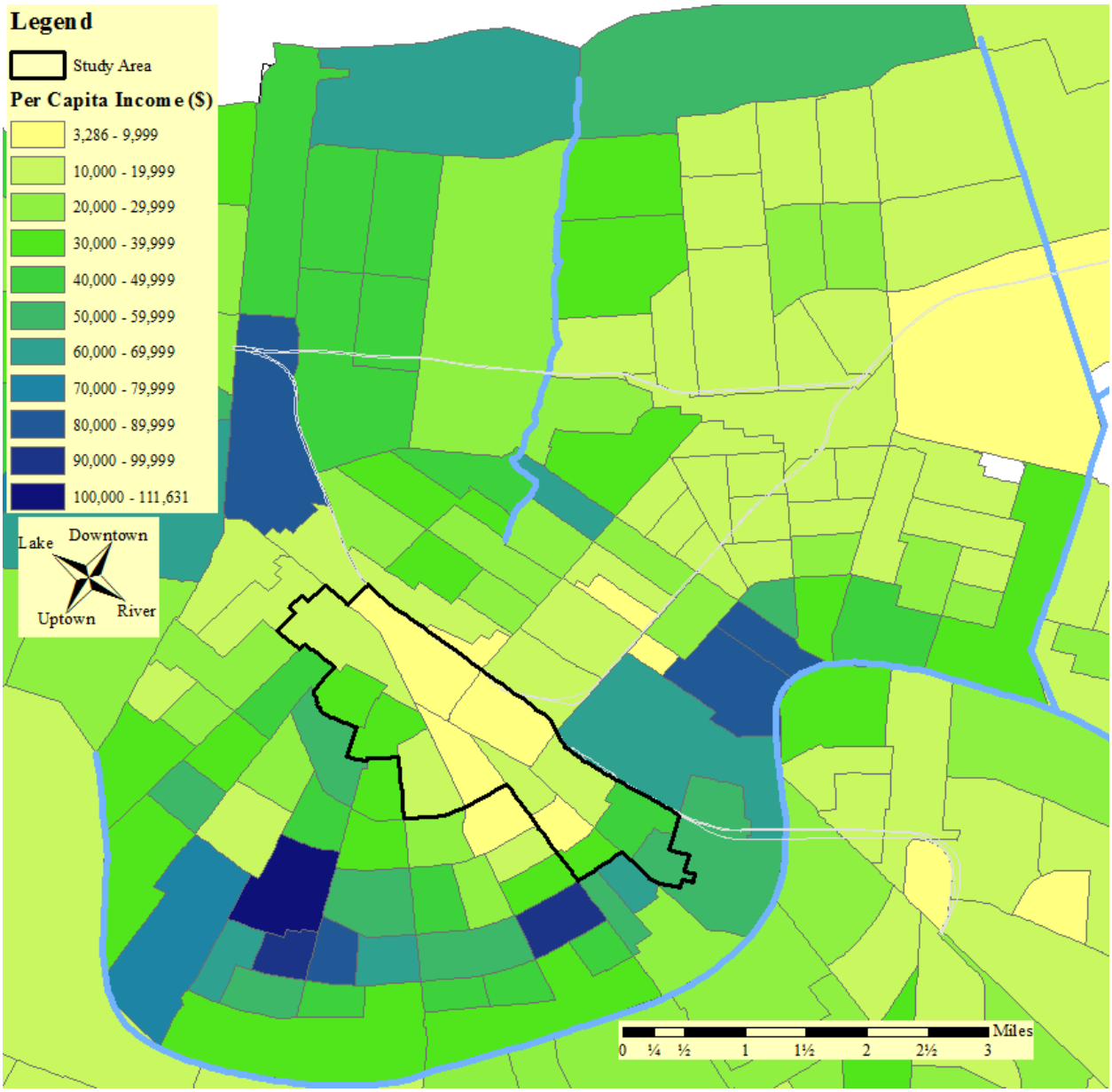

Figure IV-C Per Capita Income by Census Tract

Land Use[2]

As a 2 ¼ mile corridor running perpendicular to the Mississippi, Martin Luther King, Jr. Boulevard connects varied neighborhoods. It begins at the edge of the leafy Lower Garden District, runs through Central City, and past two public housing projects, until reaching Pumping Station No. 1. From there, disparate sections of the corridor continue into the Gert Town and Marlyville neighborhoods. As such, land uses within the study area are highly diverse. As shown in figure IV-D, the following zoning districts, as defined by the New Orleans Comprehensive Zoning Ordinance, exist along the corridor:

- Historic Urban Neighborhood Districts
    - HU-RD1 Two-Family Residential District
    - HU-RD2 Two-Family Residential District
    - HU-RM1 Multi-Family Residential District
    - HU-RM2 Multi-Family Residential District
    - HU-B1A Neighborhood Business District
    - HU-B1 Neighborhood Business District
    - HU-MU Neighborhood Mixed-Use District
- Commercial Center & Institutional Campus
    - C-1 General Commercial District
    - C-2 Auto-Oriented Commercial District
    - C-3 Heavy Commercial District
    - MU-1 Medium Intensity Mixed-Use District
    - MU-2 High Intensity Mixed-Use District
- Centers for Industry
    - LI Light Industrial District (Pumping Station No. 1)

Additionally, the following zoning districts exist elsewhere within the study area:

- Open Space Districts

[2] City of New Orleans. Comprehensive Zoning Ordinance. https://czo.nola.gov/home/

- OS-N Neighborhood Open Space District

- Historic Urban Neighborhood Districts
  - HU-RS Single-Family Residential District
- Commercial Center & Institutional Campus
  - EC Educational Campus District (Xavier University)
- Centers for Industry
  - BIP Business-Industrial Park District

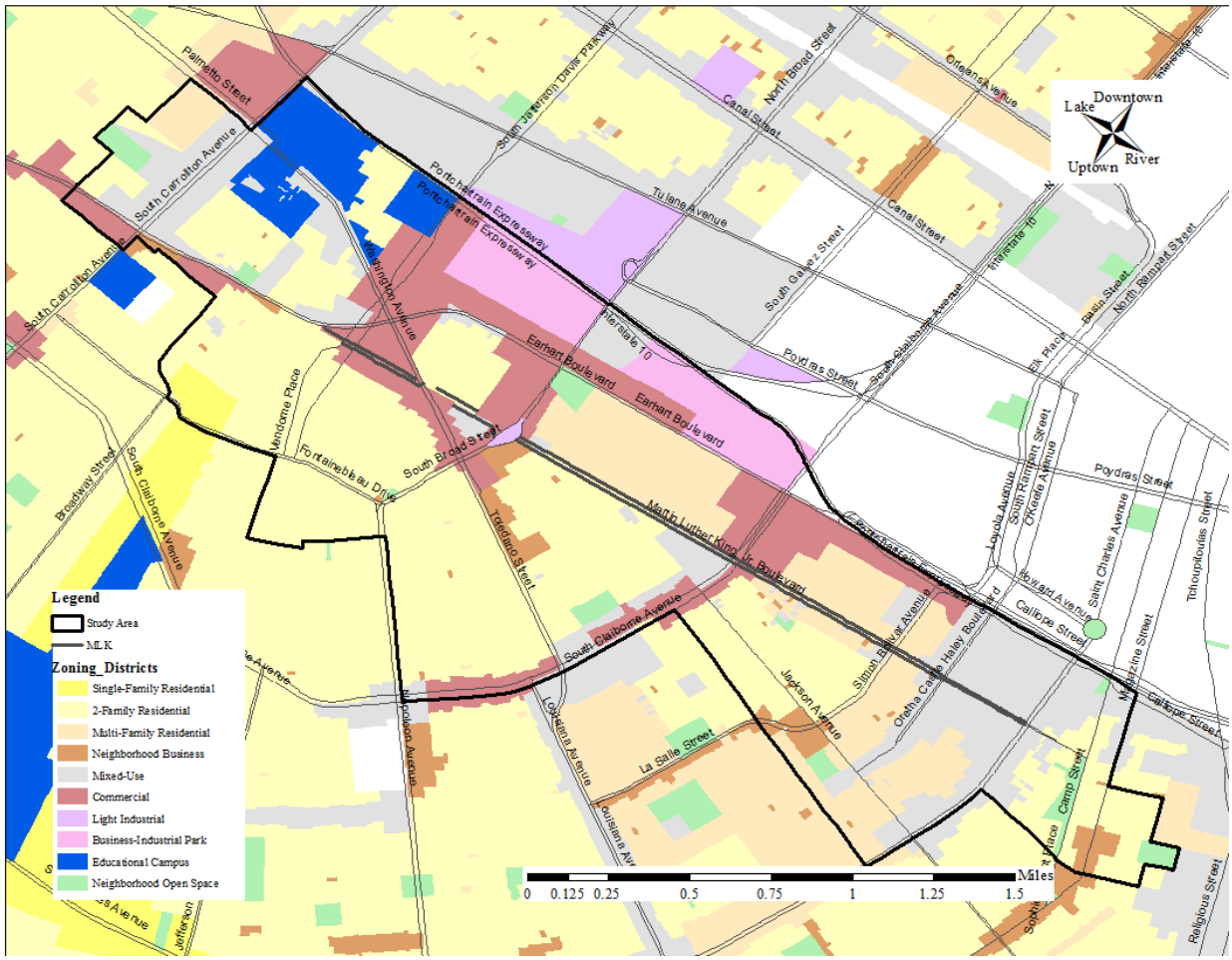

Figure IV-D Zoning Districts

The following zoning overlays exist along various corridors within the study area:

- CPC Character Preservation Corridor Design District
  - Magazine Street and St. Charles Avenue
- EC Enhancement Corridor Design District

- Broad Avenue, Carrollton Avenue, Claiborne Avenue, Earhart Boulevard, Jefferson Davis Parkway, Oretha Castle Haley Boulevard, Simon Bolivar Avenue, and Washington Avenue

- HUC Historic Urban Corridor Use Restriction District
  - Carrollton Avenue, Claiborne Avenue, and Earhart Boulevard
- Magazine Street Use Restriction District
- St. Charles Avenue Use Restriction District

Topography

New Orleans regularly suffers major flooding events often resulting in property damage. This is a result of the combination of a climate that produces large rainfall events and the unusual topography of the city. The central portions of New Orleans are low-lying areas bounded on one side by the large natural levee along the Mississippi River and on the other by a low ridge that follows a former course of the river. Much of the area across the ridge lies below sea level and

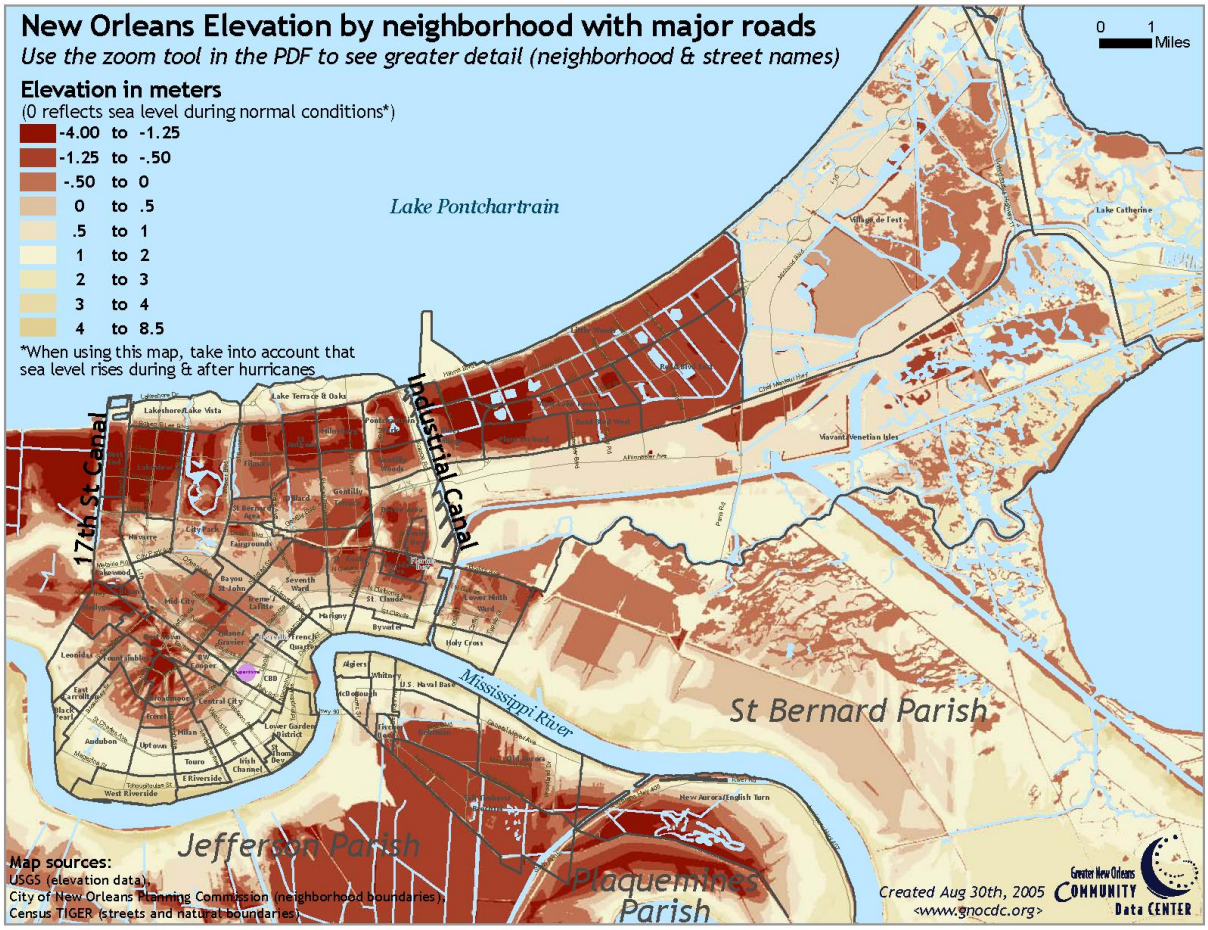

Figure IV-E Orleans Parish Elevation Map

relies on an artificial levee to hold back Lake Pontchartrain. Therefore, any rain that falls within the city must be pumped through large pumping stations over the ridges and levees out into the lake.[3] Unfortunately, demand in the city often exceeds capacity and the water fills streets and sometimes flows into basements and ground-level floors of buildings.

MLK serves as a cross section of this topography. The natural river levee in this section of the city has an elevation of approximately 18.8 feet. MLK begins on the "backslope" of this ridge running toward the city's central bowl. By the time it reaches Claiborne Avenue, MLK is below sea level. The lowest point along the corridor is at Pumping Station No. 1, at which the bed of the canal is 12.7 feet below sea level. From here, the canal runs uphill to Carrollton Avenue at

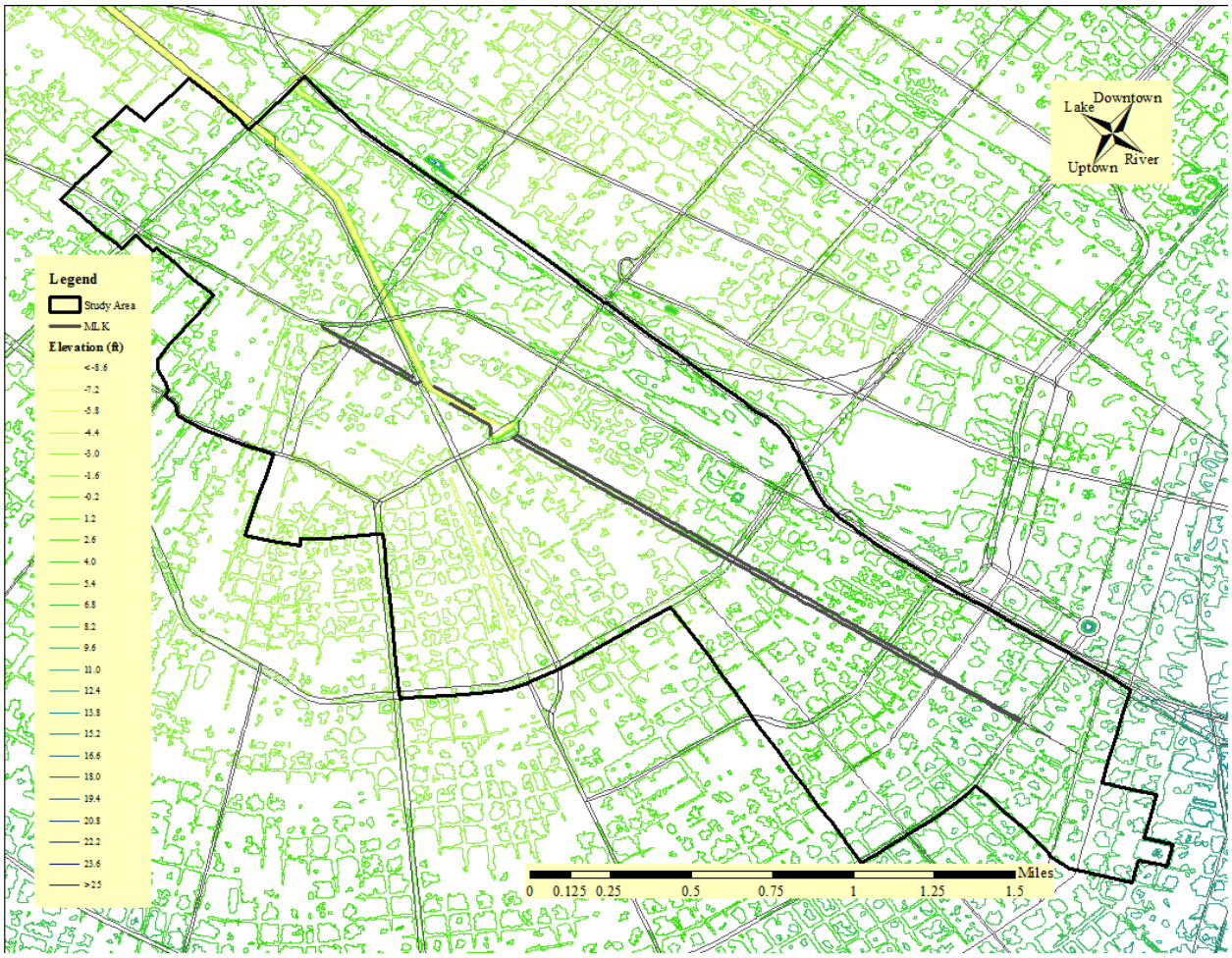

Figure IV-F Study Area Topographic Map

[3] "Development of the New Orleans Flood Protection System Prior to Hurricane Katrina." *Journal of Geotechnical and Geoenvironmental Engineering* 134, no. 5 (2008): 602-17.

an elevation of approximately 3 feet. From this point, it runs downhill to the parish line, where it meets the Monticello Canal at an elevation of approximately 3 feet below sea level. Eventually, it reaches Lake Pontchartrain, where it is pumped over the artificial levee.

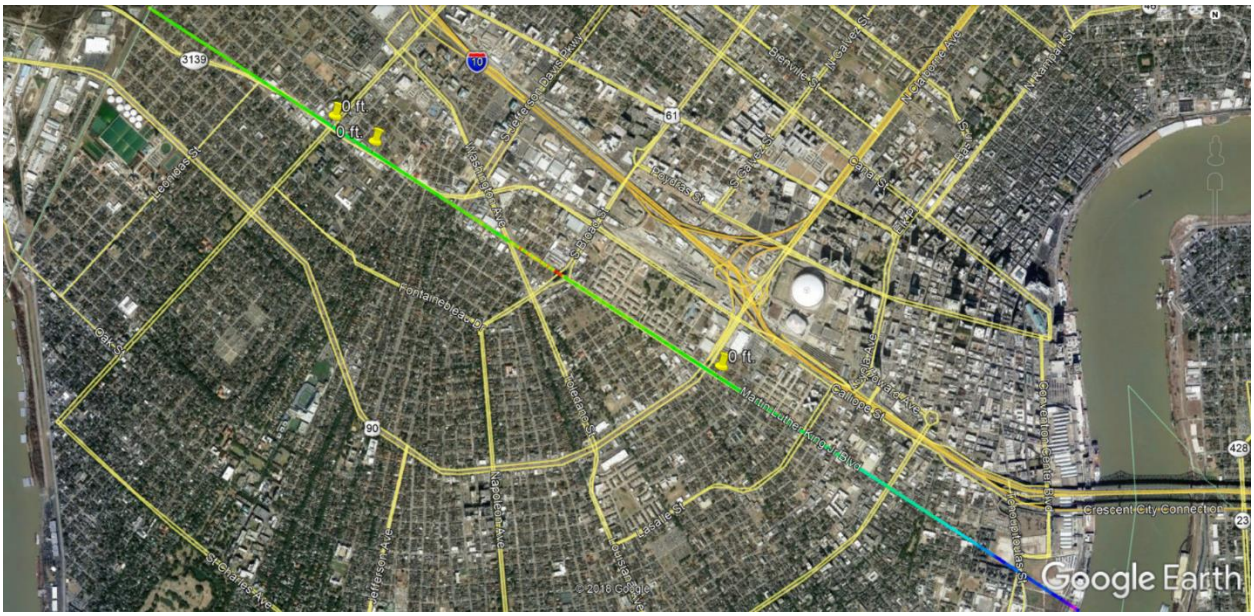

Figure IV-H Elevation Transect
Source: www.gpsvisualizer.com and Google Earth

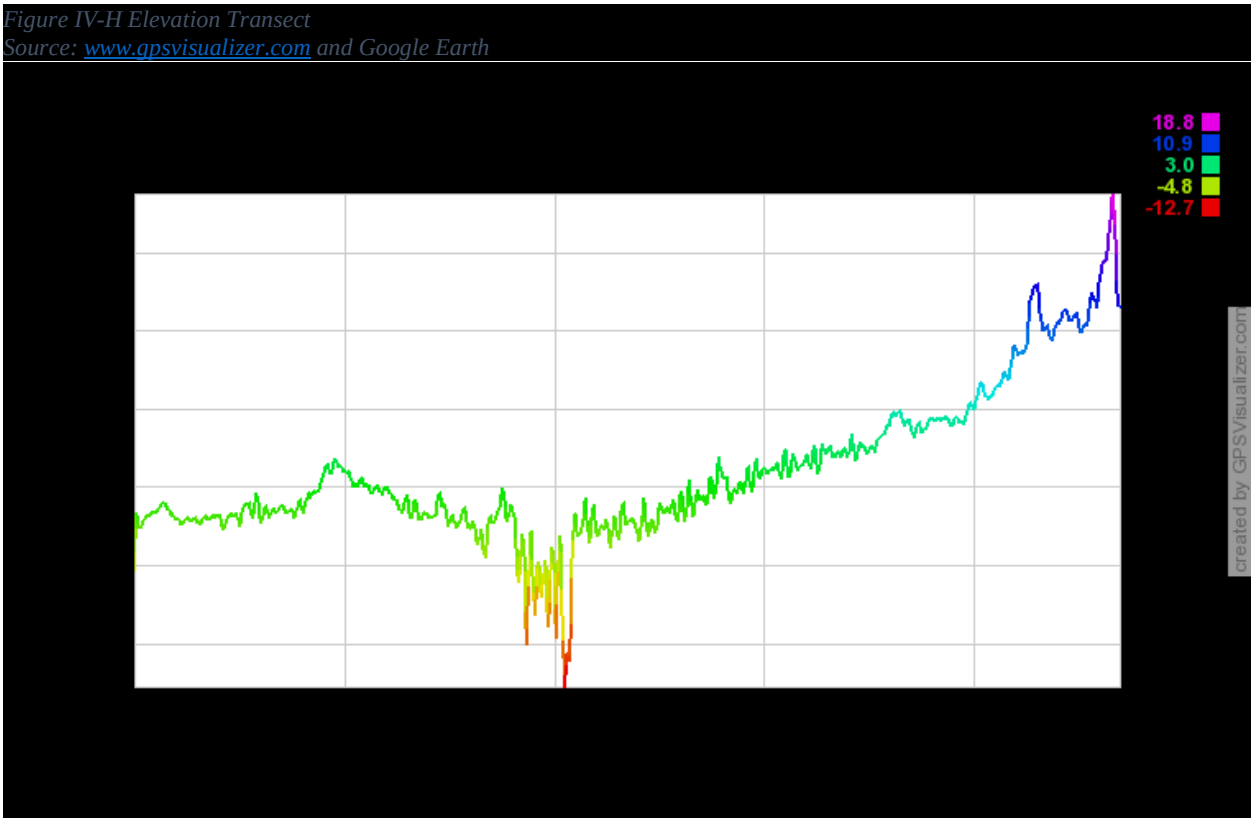

Figure IV-H Elevation Profile

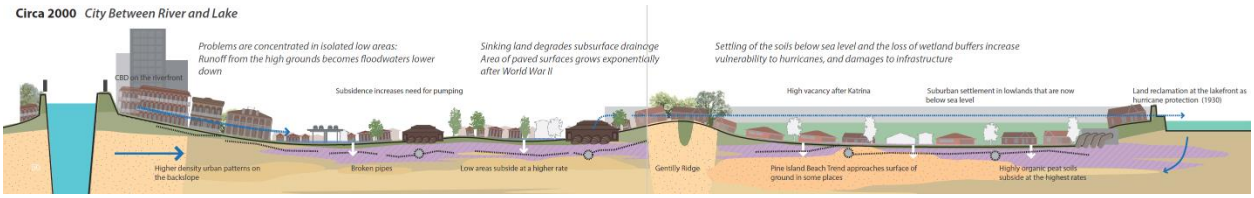

Figure IV-I Generalized cross-section of New Orleans
Source: Greater New Orleans Urban Water Plan

Existing Infrastructure

Various public and private agencies have jurisdiction over infrastructure running through the MLK right-of-way.

The Sewage and Water Board of New Orleans (SWBNO) manages the City's major storm-water drainage facilities, including Pumping Station No.1 and the Palmetto Canal. SWBNO is a special district—coterminous with the city and parish—created by the Louisiana State Legislature in 1899. Its members are "the Mayor; the two at-large members of the city council; one district councilman selected by the Council; two members of the board of Liquidation, City Debt; and seven citizen members appointed by the Mayor."[4] Members serve terms of various lengths and meet once a month. The board manages the water, sewage, and drainage systems within the city. SWBNO's stormwater drainage infrastructure includes: 24 manned pumping stations, 12 auto-matic pumping stations, 90 miles of open canals, and 90 miles of subsurface canals. The board provides all levels of service for these systems and the city does not rely on any facilities outside its boundaries.

[4] Sewerage and Water Board of New Orleans. https://www.swbno.org/

Figure IV-J SWBNO Pump Station Drainage Map

Below the MLK neutral ground runs one of the SWBNO's major subsurface canals, fed by smaller canals serving the surrounding neighborhoods. At Broad Street, MLK is disrupted by Pumping Station No. 1, which is fed by multiple subsurface canals serving Uptown neighborhoods, as indicated in figure IV-J. Water pumped through the station flows into the open Palmetto Canal, which bisects a section of MLK before running out of the corridor. Ultimately, the water drained from MLK flows into Lake Pontchartrain through the 17th Street Canal. From the foot of MLK to the mouth of the 17th Street Canal, stormwater will have flowed over 7.3 miles through SWBNO's canals and pumping stations. While the street and buried canal have historically been managed in parallel with minimal interaction, significant efforts are underway to streamline the coordination of water and transportation projects.

Recently, SWBNO began incorporating GSI into its operations with a $2.5 million, 5-year pilot program that is nearing completion. The program is generally considered a success by stake-holders, but a renewal of the program has become uncertain due to a recent change in mayoral administration and increased scrutiny of management practices at SWBNO. In a city defined by

water, the Sewerage and Water Board wields significant political power, and its decisions have the potential to greatly impact MLK.

The City's Department of Public Works (DPW) is the primary entity responsible for constructing and maintaining streets and other transportation infrastructure, such as the city's bicycle and pedestrian networks. DPW jurisdiction includes 1,547 miles of streets and it also bears the responsibility for maintaining the 105 miles of state and federal highways within the City. Additionally, DPW controls significant stormwater infrastructure, including 68,092 catch basins and 8,200,000 linear feet of drainage pipes. This stormwater infrastructure is largely local infrastructure feeding water into SWBNO's network. While these two agencies have traditionally operated independently, significant efforts are underway to coordinate the planning and maintenance the stormwater infrastructure, as well as better coordinate any construction activities impacting the right-of-way.

While DPW and SWBNO are the largest players in the MLK right-of-way, a third public entity is at play in the corridor in the form of the New Orleans Department of Parks and Parkways. The department manages "approximately 2,000 acres of public green space, including neutral grounds, parks, historic sites, playgrounds, two golf courses, and approximately 500,000 public trees."[5] The Department of Parks and Parkways provides the routine maintenance and management of the MLK neutral ground in conjunction with the rest of its maintenance responsibilities.

Additionally, private utility companies own facilities along the corridor. Notably, Entergy Corporation controls the local electric grid, including a high-capacity transmission line that runs along much of the corridor. Entergy is a Fortune 500 company headquartered in New Orleans. Its transmission system comprises 15,700 circuit miles of transmission lines and 1,500 substations covering portions of Arkansas, Louisiana, Mississippi, Missouri, and Texas.

[5] City of New Orleans (2016). *2016 Annual Operating Budget*. https://www.nola.gov/mayor/budget/documents/2016-adopted-budget-book-file/

Public Transit

Public transportation in New Orleans is provided by the New Orleans Regional Transit Authority (NORTA). NORTA has operated the city's bus, streetcar, and demand response operations since 1983. In 2017, the system counted 18,817,400 passenger boardings.[6] It is worth noting that transit service has not yet recovered to pre-Katrina levels. In 2004, the system counted 41,264,200 passenger boardings—over twice as many as 2017.[7] Furthermore, with transit, the average New Orleanian can only access 11% of the region's jobs in 30 minutes or less, while with driving, 86% of jobs are accessible in the same time-frame.[8]

While Central City's proximity to the Central Business District and French Quarter means that employment is relatively accessible, transit service is still less than ideal. The study area is served by 11 bus routes and one streetcar line, one of which runs along MLK and another seven that intersect the corridor. Based on methodology designed by Ride New Orleans[9] the average peak-hour headway for the study area's transit routes is 35 minutes. The most frequent route is the St. Charles Streetcar, which runs every nine minutes, followed by the 94 Broad bus, which runs every 15 minutes. The least frequent bus is the 202 Airport Express, which runs every 93 minutes, while the least frequent local bus is the 32 Leonidas-Tremé, which runs every 49 minutes. The 28 MLK runs every 40 minutes during peak hours.[10]

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[6] American Public Transportation Association (2017). *Public Transportation Ridership Report: Fourth Quarter 2017*. Washington, DC. http://www.apta.com/resources/statistics/Documents/Ridership/2017-Q4-Ridership-APTA.pdf

[7] American Public Transportation Association (2004). *Public Transportation Ridership Report: Fourth Quarter 2004*. Washington, DC. http://www.apta.com/resources/statistics/Documents/Ridership/2004-q4-ridership-APTA.pdf

[8] Ride New Orleans (2017). The State of Transit 2017: Creating our Transit Future. New Orleans, LA.

[9] *Ibid*.

[10] New Orleans Regional Transit Authority. https://www.norta.com/

Field Observations

Over the course of three days, I walked the MLK corridor, observing the land uses and infrastructure in "urban diaries" style.

Land Use

One of the most significant land uses in the corridor is vacant lots. Virtually every block in the corridor has at least one vacant lot, constituting 192 of the 709 parcels along the corridor. Vacancy generally increased as the corridor descended the backslope into the bowl. One block at the intersection of MLK and Galvez Street had 15 vacant parcels. I initially recorded the locations of "abandoned" buildings, but it became clear that the decrepit condition of a building did not necessarily indicate that it was uninhabited. That said, buildings in extremely poor condition were also found along the entire corridor. It is also notable that as the elevation of the land decreased, the elevation of the homes increased. At the bottom of the bowl, many homes have been raised many feet above ground level.

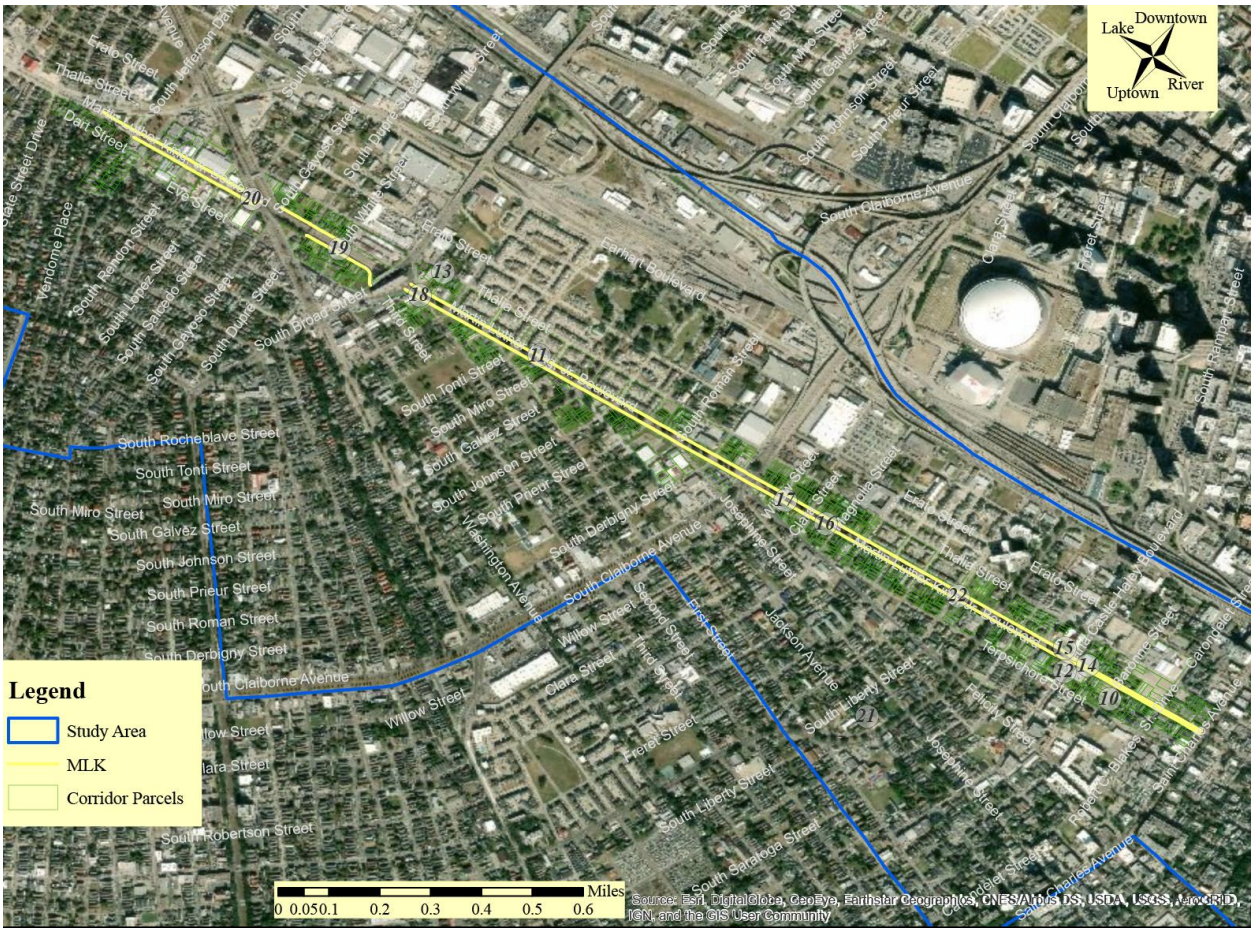

Figure IV-K Field Observation Locator Map

In terms of land use, one of the most significant community assets is the number of churches. I observed 10 churches situated along the 2 ¼ mile-long corridor, with many more situated on adjacent blocks. Sylvanie Williams College preparatory is located on MLK at Derbigny Street, and other schools lie within a couple blocks of the corridor. The two public housing projects include nine blocks within the corridor, as well as many adjacent blocks. Both projects begin on the downtown side of MLK and extend out in that direction. As seen in figure IV-M (11), the projects are both built as New Orleans-style townhouses surrounding a mid-block parking area. While they are generally well maintained, they are now about 10 years old and are showing their age, particularly due to fading paint.

Figure IV-M Typical block on MLK (10)

Figure IV-L Typical block in Marrero Commons housing project (11)

There are also various properties that have clearly received significant recent investment and could be seen as evidence of gentrification. These properties are primarily concentrated on the four blocks riverside of Rampart Street. These include the New Orleans Jazz Market and the Southern Food and Beverage Museum—both at the intersection of MLK and Oretha Castle Haley Boulevard (O.C. Haley), as seen in figure IV-N (12). The most significant new residential development is the five-story Harrell Building. The development includes 70 units for senior citizens and ground floor retail spaces that include a mix of commercial enterprises and social service agencies, including the New Orleans Redevelopment Agency (NORA). More

Figure IV-N Bikeshare in front of Southern Food & Beverage Museum (12)

Figure IV-O Wayward Owl Brewing Co. (13)

significant investment will likely occur with the recent purchase of the two-square block Brown's Dairy facility, situated on MLK at Carondelet Street.

Further along the corridor, on Thalia Street at Broad Avenue, the old Gem Cinema has recently been repurposed as the Wayward Owl Brewing Co, as seen in figure IV-O (13). The last major investment occurs on the last segment of the corridor at the intersection of MLK and Jefferson Davis Parkway. This takes the form of a major addition to the facility operated by Total Community Action, a non-profit.

Figure IV-P MLK Section Map

Right-of-Way and Infrastructure

MLK can be divided into five sections: 1) St. Charles Avenue to O.C. Haley; 2) to Claiborne Avenue; 3) to Broad Avenue; 4) to Washington Avenue; and 5) to Earhart Boulevard. See figure IV-P.

Figure IV-Q Section 1 of MLK (14)

The right-of-way on the first section of MLK spans 62 feet, as seen in figure IV-Q (14). Instead of a neutral ground, this section merely has a narrow concrete median separating the riverbound and lakebound traffic. While lanes are unmarked, the riverbound roadway is 30 feet wide, functionally allowing for two travels lanes and a parking lane. The lakebound roadway is 20 feet wide, allowing for only one travel lane and one parking lane.

Figure IV-R Section 2 of MLK (16)

Section 2 widens to span 127 feet, as seen in figure IV-R (16). Each direction has two 10-foot vehicular travel lanes and one 9-foot parking lane. Unlike section 1, the sidewalks are generally separated from the roadway by a planting strip. The neutral ground is 44 feet wide and includes a central, paved walkway lined by native trees of various species. The trees are generally fairly small and may have been planted within the last few decades. Significant recreational and other neighborhood-level activity occurs along this section of the neutral ground. The area around Liberty Street is particularly active, likely supported by a corner store, a park managed by the Housing Authority of New Orleans, and the Leidenheimer Bakery. The first block of the neutral ground at Oretha Castle Haley Boulevard has

Figure IV-S Martin Luther King, Jr. Commemorative Sculpture (15)

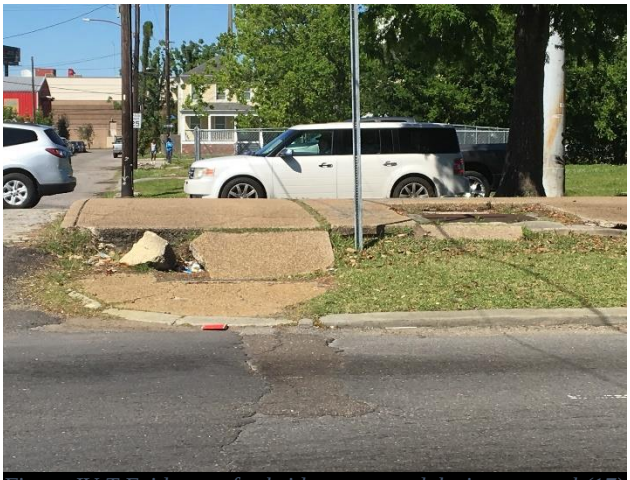

Figure IV-T Evidence of subsidence around drainage canal (17)

a memorial sculpture commemorating Martin Luther King, Jr. and a sign indicates that plans are underway to rebuild this commemorative block of the neutral ground, as seen in figure IV-S (15). The effects of subsidence become increasingly evident along this section. By the time MLK reaches Claiborne Avenue, the street has subsided significantly, while the more heavily engineered subsurface canal retains its original elevation, as seen in figure IV-T (17). This has resulted in much-damaged infrastructure and water flowing away from the canal.

Section 3 narrows slightly to span 124 feet, as seen in figure IV-U (18). Each direction has two 10-foot vehicular travel lanes, a 5-foot bicycle lane, and a 7-foot parking lane. The neutral ground is 43 feet wide, with large, old oak trees running down its center.

Figure IV-U Section 3 of MLK (18)

Section 4 widens to span 143 feet, as seen in figure IV-V (19). This is due in large part to the presence of the 85-foot wide, concrete-lined Palmetto Canal. The upriver side of the canal has a 20-foot roadway running from Broad Street to Dupre Street. The downriver side has a 16-foot wide roadway running from White Street to Gayoso Street. These sections are connected by a pedestrian bridge at White Street.

Figure IV-V Section 4 of MLK (19)

Section 5 narrows to span 118 feet, as seen in figure IV-W (20). This is a result of the Palmetto Canal turning to parallel Washington Avenue. As a result, this is the one section of MLK that doesn't have a drainage canal. However, it still has a 46-foot wide neutral ground, which is primarily used for parking.

In addition to MLK, seven intersecting streets have neutral grounds of varying widths: St. Charles Avenue, O.C. Haley, Simon Bolivar Avenue, Liberty Street, Claiborne Avenue, Galvez Street, and Jefferson Davis Parkway. While there are exceptions, most of these neutral grounds indicate the presence of drainage canals feeding into the canal that runs under MLK. One exception is St. Charles Avenue, where the neutral ground serves the streetcars that run along its rails.

Figure IV-W Section 5 of MLK (20)

In terms of infrastructure, it became clear that the quality of the sidewalk is directly correlated to the quality of the building. While, there may be a new sidewalk in front of a well-maintained residence, it will virtually disappear in front of the adjacent vacant lot.

Intersecting Corridors

Land use in New Orleans has been shaped largely by the city's historical orientation to the Mississippi. The original plantations had short river frontages and extended back indefinitely into the swamp. As the plantations were subdivided, this basic form remained. As such, commercial and transportation corridors in the city largely run parallel to the river, while perpendicular streets are primarily residential and serve as connectors between the important corridors. MLK is a textbook example of a street running away from the Mississippi that connects more prominent corridors.

St. Charles Avenue

St. Charles Avenue is one of the most famous streets in New Orleans. Its most notable aspect is the streetcar line that has run along it since 1835—the oldest continuously operating streetcar line in the world. The streetcar has been listed on the National Register of Historic Places since 1973 and is the busiest transit route in the city. While the avenue is also well-known for the gracious antebellum mansions that line it, the section crossing MLK reflects a more transitional urban form due to its proximity to the Central Business District. This section functions as a commercial corridor with a variety of building ages and both pedestrian- and auto-oriented properties.

Oretha Castle Haley Boulevard

Oretha Castle Haley Boulevard (O.C. Haley) is generally considered Central City's "main street". Since Hurricane Katrina, the corridor has been the epicenter of investment in the neighborhood and is now considered a vibrant, attractive area. While this redevelopment is generally referred to as gentrification by residents and other stakeholders, the corridor's redevelopment has been much more community driven than in other areas of the city. In addition to coffee shops and new residential development, O.C. Haley is home to numerous non-profit agencies, business incubators, and other community resources. Today, I believe O.C. Haley serves as a rare example of an inclusive place that brings together people from different walks of life. However, stakeholders must remain vigilant to stave off economic pressures that might make the space exclusive.

Simon Bolivar Avenue

Simon Bolivar Avenue is much less commercial in nature, but is a major multi-modal corridor connecting Uptown neighborhoods with the Central Business District. The avenue's neutral ground sports gracious, old oak trees. At its intersection with the MLK neutral ground, it evokes a sense of being in a green oasis in the middle of the city.

Claiborne Avenue

The 6 to 8 lane-wide Claiborne Avenue is one of the city's most important automobile corridors, carrying U.S. Route 90. Typical of many urban boulevards carrying signed U.S. highways, Claiborne Avenue is largely lined with auto-oriented commercial enterprises. However, its location in a low-income neighborhood and distance from other commercial corridors means that it still serves significant pedestrian and transit traffic. Claiborne Avenue also has one of the widest neutral grounds in the city, due to the large subsurface canal running along its length. The neutral ground serves as a popular greenspace for local residents. The neutral ground immediately upriver of MLK notably has a small monument to Dr. Martin Luther King, Jr. Immediately east of MLK, Claiborne Avenue enters a complex interchange that also includes the Pontchartrain Expressway, Claiborne Expressway, and Union Passenger Terminal railyard. Despite Claiborne Avenue serving as a pedestrian corridor, there is no accommodation for pedestrians or cyclists crossing the interchange. Furthermore, the interchange is also one of the worst automobile choke points in the city, causing traffic to back up on Claiborne Avenue and MLK at peak times. This situation results in an extremely perilous intersection for pedestrians and cyclists.

Broad Street

The next street providing connections to points downriver is Broad Street. While not as strong as other streets closer to the river, Broad Street is developing as a neighborhood commercial corridor. The street also marks the effective end of MLK, due to the existence of Pumping Station No. 1. Not only does the station block through traffic travelling on MLK, but it sits as an island separating Broad Street's upriver and downriver lanes. The result is a difficult intersection for pedestrian traffic, especially for that travelling riverside-lakeside.

Jefferson Davis Parkway

Lying at the far end of MLK, Jefferson Davis Parkway is the last noteworthy corridor. Aptly named a "parkway", the Jeff Davis neutral ground includes playgrounds and fields. It also contains a popular bicycle path connecting Uptown with Mid-City, Bayou St. John, and the Lafitte Greenway.

Pontchartrain Expressway

While the Pontchartrain Expressway does not directly intersect with MLK, it exerts significant influence on the corridor due to its proximity. In Lynchian terms,[11] the expressway acts as an "edge", restricting travel from Uptown neighborhoods to those downtown and in Mid-City. Between St. Charles Avenue and Simon Bolivar Avenue, the expressway functions mostly as a "mental edge". Complete blocks and the proximity of the downtown core stimulate significant pedestrian traffic despite its aesthetically displeasing nature and heavy automobile traffic. However, beyond Simon Bolivar Avenue, the Union Passenger Terminal railyard parallels the Pontchartrain Expressway, resulting in a "hard edge", with limited crossings for any mode of traffic. Pedestrians are particularly affected with available crossings separated by over a mile. Therefore, in addition to the difficult topography, lower elevation parts of the corridor are impacted by poor street networks. As such, it is not surprising that these areas exhibit distress.

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[11] Lynch, Kevin. *The Image of the City*. Publication of the Joint Center for Urban Studies. Cambridge, Mass.: MIT Press, 1960.

People and Culture[12]

The people and culture of New Orleans are world renown for their vibrancy and uniqueness. As Central City is a major center of culture in the city, it important to this into account in the planning process. In this section, I describe Mardi Gras Indians, second line parades, local contributions to the Civil Rights Movement, uses of the neutral ground, and other miscellaneous observations of people and culture.

Mardi Gras Indians

The Mardi Gras Indian is one of the most iconic cultural features of New Orleans, as seen in figure IV-X (21). On Mardi Gras Day (as well as certain other days, such as St. Joseph's Day) roving Indian tribes can be found in many New Orleans neighborhoods, patrolling and defending their territories. In preparation for Mardi Gras Day, tribe members—almost all black men—devote thousands of dollars and countless hours hand stitching elaborate costumes inspired by traditional Plains Indian dress. The entire process takes the entire year and a new costume is made each year. The tribes have intricate rituals and hierarchies and maintain a rich tradition of singing and chanting.

Figure IV-X Mardi Gras Indian in Central City (21)

Central City serves as the main hub for uptown Indian tribes and hosts the largest annual gathering of Mardi Gras Indians in March. Therefore, Mardi Gras Indians frequently use MLK and surrounding streets for their practices.

Second Lines

Second lines are another cultural institution in New Orleans. By definition, a second line is a parade of unaffiliated participants following an official parade. While a second line can happen anywhere at any time, the largest follow the annual marches of social aid and pleasure clubs. Such

[12] As it is impossible to observe all aspects of cultural practice in one 3-day period, this section has been supplemented by my experiences living in and visiting New Orleans over the past 10 years.

clubs are neighborhood organizations designed to both provide support networks (financial and otherwise) and social programming to members. Dozens of social aid & pleasure clubs operate in Central City and many route their parades along MLK and neighboring streets. These include such clubs as Young Men Olympian, New Generation, and Lady Jetsetters.

Civil Rights Movement

Central City served as a center of activity related to the civil rights movement of the 20th Century and produced many of the movement's leaders, especially through the Dryades YMCA. Today, the neighborhood's role in the movement is memorialized in various street names and monuments. MLK is the most prominent feature in the neighborhood and plays host to many events commemorating the movement. The first block of the MLK neutral ground (at O.C. Haley) contains the Martin Luther King, Jr. Memorial Sculpture and is slated for reconstruction. In addition to renovating deteriorated infrastructure, the intention of the project is to enhance the block's commemoration of the civil rights movement with other informative and artistic features.

Use of Neutral Ground

True to its Latin and African roots, life in New Orleans is largely lived outside in public. In this respect, active use of the city's neutral grounds for gathering and recreation is a common feature, especially in African-American neighborhoods. In many neighborhoods, neutral grounds serve as a focal point, used to hold barbeques, watch parades, or just meet up with friends.

Miscellaneous Observations

- Churches are extremely common in Central City, which is likely indicative of their importance in the community.
- Corner stores are common in Central City and often serve as supplementary gathering spots, as seen in figure IV-Y (22).
- Front porch culture is strong in the neighborhood; many of my interactions with residents occurred when they saw me passing by on the sidewalk.
- I interacted with two young girls using Tonti Street to practice baton twirling (another important cultural practice).

Figure IV-Y Corner store at MLK & Liberty (22)

Stakeholder Interviews

Summarized responses to interview questions:

- What do you see as the most pressing issues in the Central City neighborhood?
    - The most common response was economic disparities, followed by poverty, violence, and displacement. Other comments largely followed along these lines, including public health, racial equity, blight, and a lack of capital. Clearly, this neighborhood is struggling economically, particularly due to the institutional racism that has created stark divides between white and black communities in the city.
- What are Central City's greatest assets?
    - Culture is clearly the neighborhood's greatest asset. In addition to mentions of culture, interviewees commented on the people, neighborhood identity, Mardi Gras Indians, culture bearers, architecture, civil rights history, and churches. Additionally, interviewees noted the neighborhood's desirable location near the Central Business District, as well as the resulting access to relatively good public transit. The revitalization of the O.C. Haley commercial corridor was also mentioned.
- What are the biggest issues specifically along the Martin Luther King Blvd. corridor?
    - The most common issue addressed by the interviewees was the congestion at MLK's intersection with Claiborne Ave. Comments related to race and poverty included the lack of community-serving retail, blight, gang violence, and housing quality. Issues with the right-of-way included road conditions, subsidence, standing water, bike and pedestrian facilities, and speeding.
- What the greatest assets of Martin Luther King Blvd?
    - By far, the most important asset of MLK is its neutral ground, which functions as a community gathering space, as well as adding greenspace to the neighborhood. The presence of the two Hope VI housing projects was also seen as a significant asset. Others included the culture, low traffic, the intersecting commercial/activity corridors, the school, the location, and the rootedness of the residents.
- How would you define 'resilience'?
    - D. Favre: "Ability to bounce back from hardship…[and] ready to adapt to rapid changes and be able to rebuild after catastrophic events."

    - A. Miller: “Ability for communities or places to recover from shocks and stresses.”
    - J.H. Banks: “The willingness, determination, and commitment to make sure that you’re here tomorrow.”
    - A. Sternad & J. Kleinschmidt: bouncing back from disaster and the “catastrophic everyday stuff.”
- How would you define ‘community resilience’?
    - A. Neal: The ability of people to hold onto culture—to continue to grow and change without losing authenticity
    - D. Favre: “Community cohesion and cultural elements that allow people to maintain psychologically in these moments of intense catastrophe, which lead to insane amounts of stress, and, so, community resiliency is a lot to do with how people come together to deal with mainly the mental hardship, but also the small scale helping each other out…neighborly level of support.”
    - A. Miller: A holistic approach—social, economic, environmental, physical and built environment
    - J.H. Banks: Demonstrated by residents’ efforts to return after Katrina.
    - J.H. Banks, A. Sternad, & J. Kleinschmidt: Desire and wanting to be in a place.
- How severe is flooding along the corridor and how might that be improved?
    - The key issues are standing water, land subsidence, non-functioning pumps.
    - Proposed solutions included integration of GSI with bike and pedestrian infrastructure, sending water to the neutral ground, installation of rain gardens and bioswales, maintaining a higher water table to minimize subsidence and adding more trees. I was also noted that while daylighting drainage canals in the city could have significant benefits, that isn’t necessarily the right answer for MLK.
- What transportation issues exist in the corridor and how might they be improved?
    - The key issue in the corridor is traffic at the intersection with Claiborne Ave. Others include poor bike and pedestrian infrastructure and school traffic. D. Favre noted that 40% of residents in the neighborhood don’t have cars.
    - Proposed solutions included introducing a road diet, or reduction in the width of the roadway to slow traffic and accommodate other uses of the right-of-way. Another solution was addition of more high-quality community-serving retail. J.H. Banks noted,

"I would love to see a public transportation system that is far more accommodating, far more reliable, far more frequent, far more used than what we have. Folks don't use public transportation because it isn't where it needs to be."

- What issues and solutions might you suggest for other right-of-way services, such as utilities and greenspace?
    - Projects related to various utility networks often happen on an agency-by-agency basis, resulting in excessive construction within the right-of-way. Agencies should better coordinate their maintenance work to minimize disruption in the right-of-way.
    - Some interviewees expressed a desire to enhance the existing uses of the neutral ground and other greenspaces.
- What is the current threat of displacement along the corridor and how might that change as a result of infrastructure improvements?
    - Thus far, displacement has been minimal, but the neighborhood is susceptible. This is due to low real estate values combined with improving amenities and a prime location. However, it will, to some degree, be limited by the existence of subsidized housing. The displacement pressure is largely moving up from St. Charles Avenue. Some believe Central City may be the "new frontier" for "gentrification". Within the zone near St. Charles, it is expected that the 2-square block Brown's Dairy site will be redeveloped soon. Depending on how the project is designed, it could have major implications on affordable housing in the neighborhood.
- How might you apply solutions to the corridor's issues in an equitable manner?
    - Interviewees had widely ranging responses, which are outlined below:

        Create a land trust.

        Ensure the presence of natives and culture bearers.

        Create affordable housing policies and mechanisms to ensure that infrastructure improvements don't cause displacement.

        Put in things useful to residents but avoid signifiers of gentrification.

        Explore the potential to implement tax increment financing.

        Invest in affordable housing and infrastructure simultaneously.

        Explore the potential of cooperative property ownership.
- How could land use planning & regulation play a role?

- Interviewees had widely ranging responses, which are outlined below:
    - Shift decision-making to the community level.
    - Explore opportunities with public properties.
    - Include adjudicated properties in public land inventories.
    - Encourage community-oriented retail.
    - Use more creativity.

- What cultural uses and associations should be considered when planning interventions in the MLK corridor?
    - The most common responses by interviewees related to parades, including second lines, Mardi Gras Indians, Super Sunday. Additional responses included recognition of the neighborhood's civil rights history, the community institutions on O.C. Haley, the community boards in the housing projects, schools, existing businesses, and the neutral ground.
- Are the any variations along the corridor that might necessitate different interventions?
    - The following zones and variations were highlighted:
        - Congested section near Claiborne Avenue
        - MLK increases in width as it approaches the lake.
        - Commercial intersections
        - Zones with less commercial activity
- Based on our discussion, what do you believe are the key interventions along the corridor that will promote community resiliency?
    - Fresh food access
        - Especially community gardens
        - Food forests have potential to function as GSI.
    - Road diet
    - Placemaking at major intersections
    - Water management
    - Improve informal uses already occurring.
    - Identify public land assets.
    - Increase community-serving retail.
    - Give the existing residents the tools to stay and thrive.

- The things needed are small, “unsexy”.
- Improve pedestrian access to the neutral ground.
- “Let’s make [cycling] a safe experience.”

V. Analysis and Recommendations

As one of the American cities most vulnerable to climate change, New Orleans must adapt its neighborhoods. At the core of this adaptation is augmentation of the existing drainage system with green and blue stormwater infrastructure. A conventional drainage system simply cannot handle the extreme precipitation events that now deluge the city with frequency. Therefore, residents must learn to accommodate floodwater in their neighborhoods for some period of time. The existing drainage canal below MLK makes it an important corridor when considering how green and blue infrastructure systems should be implemented in the city.

New Orleans had long been in decline, but since Katrina has entered an era of reinvestment and increased interest to wealthier groups, such as young professionals. Many neighborhoods have experienced significant economic displacement of existing residents, especially African-Americans. Thus far, Central City has avoided much of the displacement experienced by other central neighborhoods and even a full economic transition would be limited by the two public housing projects in the neighborhood. However, a balance must be struck between investing in neighborhood improvements and preserving the ability of current residents to remain in their community.

At the heart of the neighborhood is the MLK neutral ground. This space functions as a linear public square, providing a venue for both quotidian social activities and special events, such as second lines. Therefore, the neutral ground, especially with its linear nature, draws the community together in remarkable ways.

Recommendations for Urban Design

Numerous interventions may be employed along MLK to improve the neighborhood's resilience. As environmental, economic, and cultural resilience are integrally linked, all investments in resilience should likewise address a variety of issues. As such, all of the proposed interventions offer multiple benefits. It should be noted that these tools can only be successful if properly designed. (For example, a bioswale should be full of trees in order to be most effective.) In order to provide an incremental framework, I have organized the tools roughly from the least-costly investments to the most significant alterations.

Street Trees

Large shade trees already form an integral part of the New Orleans landscape; however, the City is still working to restore trees lost to Katrina. Today, many more streets lack a tree canopy than before the storm. With such a hot climate, large trees are critical to regulating temperatures and maintaining residents' health and comfort. In addition to moderating temperature, mature trees require enormous amounts of water. This makes them ideal for flood management. Street trees can be placed below-grade in single boxes or linear trenches in order to collect surface runoff. Especially with the city's high temperatures, every opportunity to incorporate stormwater trees should be taken.

Food Forests and Community Gardens

With so many vacant lots along the corridor, there is significant potential to convert some into community gardens and food forests. Such uses would not only eliminate the blight of vacant lots but provide low-cost fresh produce to low-income residents. These gardens and food forests would be most useful in the lower elevation areas between Claiborne and Broad. This zone has much more available land for this use and is also most in need of large-scale GSI. These gardens would improve health, reduce lost time traveling to far-away grocery stores, increase financial capital, and augment community life. NORA has recognized these benefits and encourages the creation of urban gardens on vacant properties with its Growing Green program. Community gardens and particularly food forests, have the potential to also function as GSI. As trees can soak up so much stormwater, the existence of orchards could significantly mitigate flooding.

Stormwater Lots

SWBNO and NORA have already partnered to create stormwater lots, including some within the study area, as seen in figure V-A. These grassy lots contain depressions designed to collect water during a storm and slowly release it into the drainage system, as well as directly into the ground. The lots also contain trees to further aid in removing the water. While these lots are seen as a success, the uncertain future of SWBNO's green

Figure V-A SWBNO Stormwater Lot in Study Area

infrastructure program likely means that further vacant lots will not be redeveloped in this manner in the near future.

Stormwater Curb Extensions

With wide roadways and high-speed traffic, crossing the street to reach the neutral ground, or for other purposes, can be a dangerous experience. While most of the corridor should eventually be reduced to one automobile lane in each direction, a good, incremental step would be the installation of curb extensions at intersections. As parking is already restricted near intersections, this space at present is underutilized. Therefore, installing curb extensions would shorten the crossing distance for pedestrians without taking space from other ROW users. Curb extensions are particularly attractive because they can be installed quickly with low cost materials. Ideally, these extensions would be made permanent with more extensive curb-and-gutter work, but the community can implement a temporary solution to test the concept and wait for the appropriate funds. Curb extensions also provide an excellent opportunity to install bioretention cells and stormwater trees to manage flooding. In the interim phase, planter boxes can be utilized to form a barrier between the roadway and the extended pedestrian zone. While planter boxes don't have the same stormwater capacity as more permanent investments, they still provide an improvement over the underutilized section of pavement. Groundwork N.O. has experience installing similar GSI, both temporary and permanent, and could be engaged to perform this work along MLK.

Extend Neutral Ground Promenade

Currently, the neutral ground promenade only runs from O.C. Haley Boulevard to Claiborne Avenue. The section of the neutral ground with the promenade is extremely popular, while the portion without the promenade sees much lower usage on a daily basis. While this may be partly tied to the lower population densities in the lakeside section of the neighborhood, a promenade would still facilitate greater use. Furthermore, it would improve the connection between the different sub-neighborhoods of Central City, as well as to surrounding neighborhoods. The other significant issue is the lack of curb ramps and other infrastructure connecting each block of the promenade. Improvement of these connections would increase the promenade's viability as a pedestrian travel corridor, much as has occurred with other neutral grounds, such as Jeff Davis Parkway.

Cycle Track

While many of the city's other neutral grounds have multi-use pathways, the best option for MLK would more likely be the installation of a cycle track, in addition to the promenade, such as the one shown in figure V-B. In its present form, the promenade functions primarily as a public plaza—a place to linger. While improving pedestrian travel would enhance this use, the increased presence of bicycles would not. However, bicycle usage is significant along the corridor and a safe facility is needed to support this. Luckily, the generous width of the ROW and low traffic volumes, would make it easy to replace an automobile lane with a cycle track. Such a facility would improve health, safety, and access to employment and educational opportunities for residents of the neighborhood. Additionally, it would connect to existing bicycle facilities in the neighborhood, moving the city closer to its goal of developing of complete bicycle network.

Figure V-B Cycle Track in the Netherlands

Bioretention Swale and Planters

Ideally, GSI would run the entire length of the corridor, most likely in the form of a curbside bioretention swale, as shown in figure V-C. Swales are shallow, vegetated depressions with sloped sides designed to capture surface runoff and oftentimes have a porous pipe running below the surface to aid conveyance of water away from the flooded area, while allowing for infiltration into the groundwater. The downside of swales is their large footprint. The same goals can be accomplished with a bioretention planter, which has vertical sides. However, these are more expensive and may not be worth the extra investment in a ROW with a generous width, such as MLK. These features are also an effective way to remove underutilized sections of roadway.

Figure V-C Bioswale Curb Extension on O.C. Haley

Bioretention planters can be incorporated, not only along the curb, but also into floating islands. In the context of MLK, this could be particularly useful for buffering the cycle track from the

roadway. Additionally, they can be incorporated into transit boarding islands, increasing passenger comfort as they wait for the bus.

Permeable Pavement

With such major precipitation events, every measure must be employed to mitigate flooding. Therefore, installation of permeable pavement can complement the other components of GSI. While permeable pavement technology doesn't currently support high-traffic volumes, other portions of the roadway, such as parking and bicycle lanes are ideal candidates for this investment. Permeable pavement is particularly attractive in New Orleans because it promotes seepage of rainwater into the ground where it falls. By encouraging this process, the effects of subsidence can effectively be mitigated.

Reclaimed Intersections

Between Claiborne Avenue and Broad Avenue, many odd intersections exist due to a break in the street grid. This creates underutilized islands surrounded by excessive amounts of roadway. These intersections provide opportunities to create small neighborhood hubs by expanding the pedestrian zone and creating greenspace that functions as GSI. One such intersection at Dorgenois Street has been redeveloped into a landscaped greenspace. However, the project was limited to the existing boundaries of the island and was not designed for active use. The largest such island is located across from Sylvanie Williams College Preparatory. Strategic improvements to this block of the corridor could be particularly successful at creating an active public plaza.

*Re-Engineer Cross-Slope

The most difficult issue in implementing these tools is the severe cross-slopes away from the neutral ground due to subsidence. While installation of GSI will limit further subsidence and improve the community's resilience, the ideal situation would be to reengineer the roadway to slope towards the neutral ground and associated drainage canal. This would allow for installation of swales within the neutral ground that could handle much greater amounts of water, while still allowing for active use when it is dry. Serious discussion must take place in the community to establish the value of such a significant investment and whether or not to make other interim investments that can be put in place more quickly.

Site-Specific Investments

St. Charles Avenue to O.C. Haley Boulevard

The section of MLK between St. Charles Avenue and O.C. Haley Boulevard is much narrower than the rest of the corridor. Additionally, it has more commercial activity. These factors mean that a resign of this section should look different from the rest of the corridor. First the sidewalks should be wider, and the cycle tracks located next to the sidewalk in order allow access to businesses. Parking should be limited to the wider road way on the downriver side of the street. While there is space for a neutral ground, it would not be wide enough to facilitate active use. This presents an opportunity to create a stormwater median—a bioretention facility with significant capacity. As it is fairly high up the backslope, this is an ideal location to slow and store water in place, mitigating the pressure on lower areas. There is potential to embrace this opportunity by daylighting the buried drainage canal.

Simon Bolivar Avenue to Liberty Street

MLK and Simon Bolivar Avenue are both major multi-modal streets with wide, tree-lined neutral grounds. As a result, their intersection is highly visible and highly trafficked. However, the intersection lacks many of the positive qualities of the adjacent portions of the streets. As it exists, there are no trees, there are significant underutilized portions of the roadway, and it functions as an edge for pedestrians traveling along the neutral ground promenade. At minimum, minor changes should be made to make this intersection safer and more comfortable for people. Additionally, there is potential to install a traffic circle in order to better tie together the intersecting boulevards. This would make a highly visible intersection more attractive, while better allowing the various modes of traffic to pass through.

The block immediately lakeside of Simon Bolivar Avenue is one of the most active on the entire corridor. In addition to its proximity to two major pedestrian corridors, it includes the Leidenheimer Bakery, a popular corner store, a church, and a park serving the Guste housing project. As a result, it is an activity center with diverse types of people present throughout the day. The park, in particular, provides an opportunity to build off the existing assets of the block. Currently, the park is little more than a basketball court, a slide, and a blighted building, all seemingly strewn haphazardly around the site the covers nearly an entire square block. This park would be a good

location to develop a stormwater park, similar in concept to Mirabeau Water Garden under construction in the city's Filmore neighborhood. Stormwater parks are designed to facilitate active recreation uses when it is dry and store large quantities of water when it is wet. A stormwater park in this location could higher quality recreation facilities—basketball court, playground, gathering spaces—than currently exist, while also serving to slow and store stormwater on the backslope as necessary. Such a park would strengthen the block's status as community hub.

Claiborne Avenue Intersection

The intersection of MLK and Claiborne Avenue is the most difficult spot along the corridor. As a major chokepoint for automobile traffic, any redesign must accommodate the large traffic load. However, the current intersection is extremely dangerous for other modes of transportation. While the engineering challenges of the intersection go beyond the scope of this project, the community's resilience depends on accommodation of all modes of transportation.

Claiborne-Pontchartrain Interchange

While this interchange is not directly on the study corridor, its impact on the corridor makes it worth consideration. Currently, there are no bike or pedestrian crossings of the Pontchartrain Expressway between Simon Bolivar Avenue and Broad Street. The addition of a connection at Claiborne Avenue would improve access to major downtown employment centers, including the Biomedical District, hotels, and the Superdome. Community efforts are already well underway to tear down the Claiborne Expressway and rebuild the corridors neutral ground and business district. That project would mean that both sides of Claiborne Avenue are major pedestrian corridors. Therefore, any such project must include a plan to add an Uptown-Downtown connection at Claiborne Avenue.

Pumping Station No. 1

The *Urban Water Plan* proposes moving the city's pumping stations to the outfalls of the drainage canals. For the MLK corridor, moving Pumping Station No. 1 would have many benefits. First, the MLK-Broad Street intersection is difficult to navigate for all modes of transportation. Removing the pumping station would allow for a simplified intersection. Furthermore, it would remove the edge blocking flow along the MLK corridor, resulting in improved connectivity between neighborhoods. Additionally, it would provide for the opportunity to transform the Palmetto Canal from an inaccessible, concrete-lined canal into a lush riparian zone. This conversion would

serve as both GSI and parkland for the neighborhood, shifting it from its current state as an edge to an attractive community gathering space. Clearly, moving the city's pumping stations is an ambitious proposal intended as a long-term goal. Many of the other tools can take the corridor far down the path of resilience for much lower cost.

Illustrations of Potential ROW Redesigns

This series of diagrams illustrates how each section of MLK could be redesigned to incorporate the urban design interventions I've identified. Section 1 is the narrowest stretch of the corridor and already supports pedestrian-oriented businesses. Therefore, I would widen the sidewalks and run bike lanes adjacent to the sidewalk in order to facilitate cyclist's access to shops and other businesses. Sections 2 and 3 are very similar and in both cases I would reduce automobile travel lanes to one for each direction. I would incorporate the reclaimed roadway into a wider neutral ground. I would continue the pedestrian promenade that already exists on section 2 along the length of section 3. Additionally, I would incorporate a bicycle path into the widen neutral ground. Unlike section 2, section 3 currently has mature live oak trees running down the middle of the neutral ground. Any redesign should maintain this asset. The most complex roadway design would occur where MLK and Claiborne intersect. For MLK's lakebound traffic approaching Claiborne, I would increase the number of vehicle travel lanes for a few blocks to accommodate the congested traffic pattern. Ideally, one lane would be reserved as transit-only at peak times. Bike and pedestrian facilities would continue across the intersection, although this would require significant design and engineering to mitigate safety issues. When feasible, the canal along section 4 would be converted into a landscaped canal that serves as a community asset. While narrower, section 5 would look almost identical to section 2. Along all sections, every opportunity would be taken to incorporate large trees.

Figure V-D Street Design Locator Map

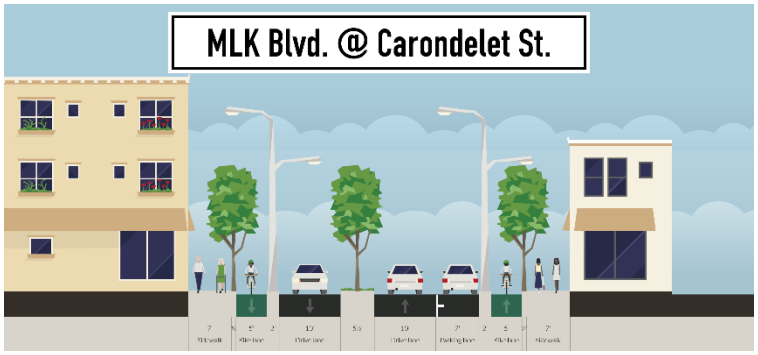

Figure V-H MLK Section 1

Figure V-H MLK Section 2

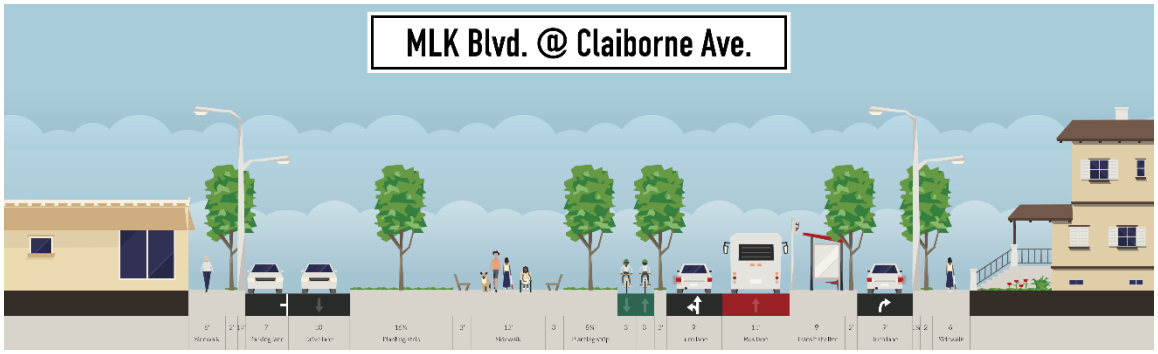

Figure V-H MLK @ Claiborne

Figure V-H MLK Section 3

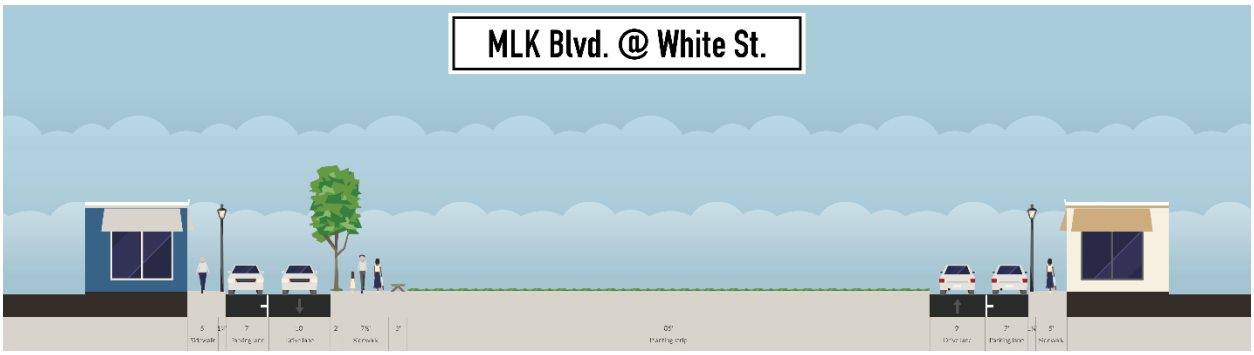

Figure V-J MLK Section 4 (with landscaped canal)

Figure V-J MLK Section 5

VI. Discussion and Conclusions

In the face of dramatic environmental and economic change, society must shift its approach to infrastructure investment. No longer can engineering and segregation of land uses and systems solve a city's problems. We must shift toward a more resilient paradigm, centered on multifunctionality, collaboration with natural systems, and equitable development.

New Orleans has one of the most complex histories, cultures, geographies, and environmental conditions of American cities. Hurricane Katrina served as a catalyst, pushing the city to become a living laboratory for developing solutions to many of the issues facing American society. Many of these issues can be grouped under the term "community resilience." We are learning that environmental, economic, and cultural issues are intricately linked. New Orleans is contending with the fastest rising seas in the United States, as well as unprecedented levels of precipitation. The city's unique geography requires creative solutions to contend with this threat. However, the decades of disinvestment in the city has left populations vulnerable any economic shift, even one intended for their benefit. Not only does this threaten the homes and livelihoods of these communities, but also their cultural practices, which are arguably some of the richest in the nation and the soul of a city so beloved for its uniqueness and vibrancy. When a community cannot survive without greater environmental protection, but development of that protection economically and culturally harms the very people it meant to protect, the issues can only be considered in a holistic manner. The 20th century paradigm of siloed thinking and investment does not suffice for 21st century problems. While New Orleans provides a compelling case study, the lessons learned can and should be applied to all U.S. cities, especially the legacy cities.

In the literature review I examined the concept of resilience, how various infrastructure systems fit into that concept, and examples of current resilient practices in both the U.S. and the Netherlands. I then examined the existing conditions in New Orleans through digital research, field research, and elite interviews. The interviews, in particular, helped me identify the key issues and appropriate solutions in my study corridor. Finally, I compiled the results of my researched into a set of recommendations in the form of a toolkit for use by the various stakeholders in the community.

Both the literature review and my interviews indicated the investments in the MLK corridor should focus on people. Moudon (1991) states that "good streets are democratic streets." Clearly,

MLK is the center of community life in a neighborhood with a vibrant culture. Already, the street, while considered an arterial, is regularly closed to automobile traffic for parades and other community events. However, speeding cars still dominate the boulevard the majority of the time. This dangerous situation is made worse by the water management issues that exist along the corridor. In order for MLK—with many existing assets—to become "democratic," these issues must be addressed. Luckily, interventions can be structured to slow traffic and soak up water at the same time. With the assets and community institutions that already exist in Central City, it provides a prime location to invest in infrastructure that facilitates community resilience. While Checker (2011) expresses concerns over the influence of "greening" projects in disadvantaged neighborhoods, clearly the current situation is unsustainable. However, using a model of participatory action research to implement the necessarily has the potential to strengthen the environment, economy, and culture of Central City. Investment within this paradigm is already occurring on a small scale thanks to organizations, such as Groundwork New Orleans. On the municipal level, while the city's government may be slow to change, it is clear that major shifts are underway.

One of the major influences of change in how the city addresses resilient infrastructure has been the Dutch Dialogues. The relationship the city has developed with the Netherlands highlights the potential for innovation to occur with intergovernmental collaboration. The Dutch have a strong model for building climate-adapted infrastructure. Additionally, they are leaders in sustainable, people-friendly living. However, there are major obstacles to turning New Orleans into a Dutch city. The storms in the Gulf of Mexico are much more extreme than the storms in the North Sea. New Orleans is located in a car-centric society that is skeptical of government regulation. Additionally, and perhaps most significant, the economic strengths of the two places are dramatically different. Despite these differences, the clearest way forward is to make New Orleans look more like Rotterdam or Amsterdam. The residents of New Orleans, especially since Hurricane Katrina, have embraced innovation. Whether in architecture, education, or food systems, New Orleans has become a center for new ideas and experimentation. Clearly, New Orleans is ripe for innovations in community resilience, especially in regard to right-of-way infrastructure, flood management, transportation, and equitable investment.

While I believe my recommendations would help make the Central City community more resilient, their implementation must be undertaken with extreme thoughtfulness. While I did not

have the opportunity to fully engage the community in this project, it can only be successful if driven by its own members. The principles of participatory action research clearly state that while it is important for the expert to contribute their knowledge, ownership of the knowledge and resulting actions must lie in the hands of the community. While this thesis outlines various interventions that would promote community resilience, I am simply one voice in the discussion and aim to be a catalyst to shift the thinking of how we invest in infrastructure and the people it serves. I encourage readers to share this document and use the principles of community resilience in their approach to decision-making, whether in New Orleans or elsewhere.

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