TOWARDS A NEW PARADIGM

MOTIVATING A SHIFT IN URBAN WATER MANAGEMENT THROUGH A LANDSCAPE ARCHITECTURE APPROACH

by

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A REPORT

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Abstract

The way America thinks about and develops with water is not sustainable (Mouritz et. al. 2003). These thoughts and actions embody a paradigm that does not value ecological functions necessary to maintain water quality and quantity for future generations (Ahern et. al. 2010). Linear water infrastructure systems of collect, treat and convey lead to issues of flooding and contamination. These systems are reaching the end of their life span in American cities. Instead of replacing them using the current development approach, which treats water as a nuisance, this study argues for a new approach, developing with water as a resource; water-centric development.

People have different perceptions regarding water resources and sustainability (Pahl-Wostl et. al. 2007). These perceptions affect the acceptance and support of public projects. Commonly, these perceptions are based upon people's personal values and the immediate benefits they reap from the project. In order for communities to shift towards a water-centric development approach, demonstration projects must work to communicate the social value in the development's hydrological functions (EPRI 2009).

This project investigates emerging urban water management paradigms and

synthesizes relevant knowledge to create a comprehensive new paradigm—New Urban Water Management (NUWM). This project focuses specifically on landscape architecture's role in catalyzing the adoption of NUWM in Kansas City by applying the paradigm as a design approach to water-centric urban development. This approach employs environmental psychology strategies to append "Motivational Aspects" to the traditional social, ecological and economical aspects of sustainable development. The methodology provides the steps and tools for designers to apply the design approach. A three part design model of 1. Hydrologic Function 2. Social Amenity, and 3. Personal Relevance guide designers in developing water infrastructure systems as social amenities that objectively connect ecological functions with personal relevance. Washington Square Park in Kansas City, Missouri functions as a case study in the application of the design approach.

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Acknowledgments

Thank you to all the LAR faculty and supporting staff. What a truly special group of individuals. I owe many of my successes, as well as my evolution as a thinker and designer, to you all. A special thank you to my supervisory committee Jason Brody, Brent Chamberlain, and Alpa Nawre. To my major professor Jason Brody, thank you for being patient with my often jumbled thought process. To Brent Chamberlain, thank you for opening up my mind to a new way of thinking and living. To Alpa Nawre, who has been a continuous source of wisdom during my time at K-State, thank you for pushing me to pursue my dreams, for encouraging me to tackle the hard questions, and for helping me to simplify the complex tornado that is my brain.

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Thank you to my friends and family for supporting me during the process of this study and throughout my academic career. A special thanks to my dad for keeping me grounded, and to my mom for being the wind in my sails. You have opened many doors for me and I appreciate your tireless efforts to set me up for success.

Thank you Seaton Hall for teaching me discipline and humility, and also for giving me a home away from home. Thank you to my classmates for selflessly helping me along the way, I can honestly say I would not have graduated without you guys - at least not sanely. A special thanks to Olivia Pitt-Perez for her unconditional friendship, and to Brendan Mannix-Slobig for always believing in me, and reminding me that I can do this - I guess you were right.

Driving Forces

The initial driving force of this project was an agreement with Kansas City's Parks & Recreation Department to assist their chosen consultant, COEN +Partners, in the redevelopment of Washington Square Park. My master's group, along with another K-State master's group, and students from the Kansas City Design Center (KCDC) worked both collaboratively and separately to investigate various issues surrounding the Washington Square Park site.

My project was an individual effort. It was inspired by the site's social and ecological contexts, and evolved as conclusions were drawn from site analysis about what this site needed to be for the City. My investigations lead me to believe that Washington Square Park needs to become a catalyst for change, motivating Kansas Citians to think about, manage, and develop with water as a resource, not a waste.

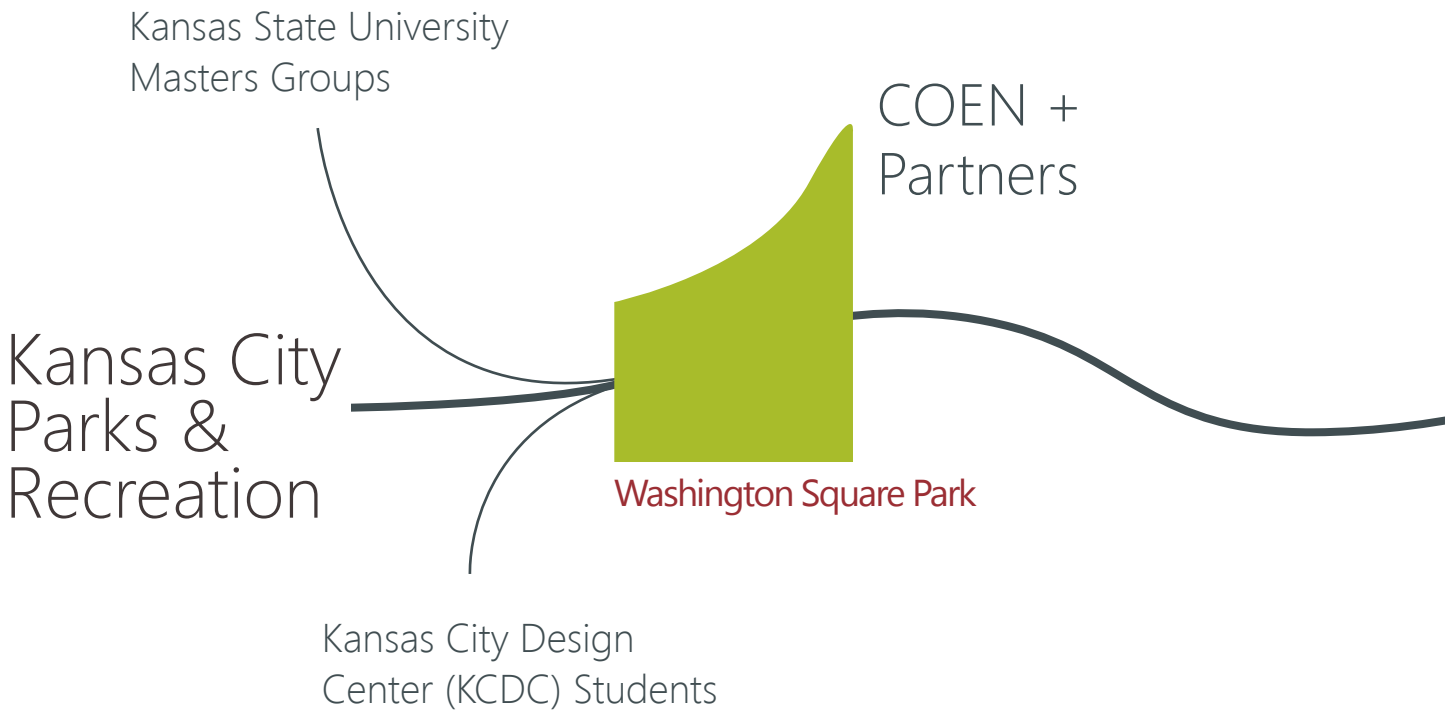
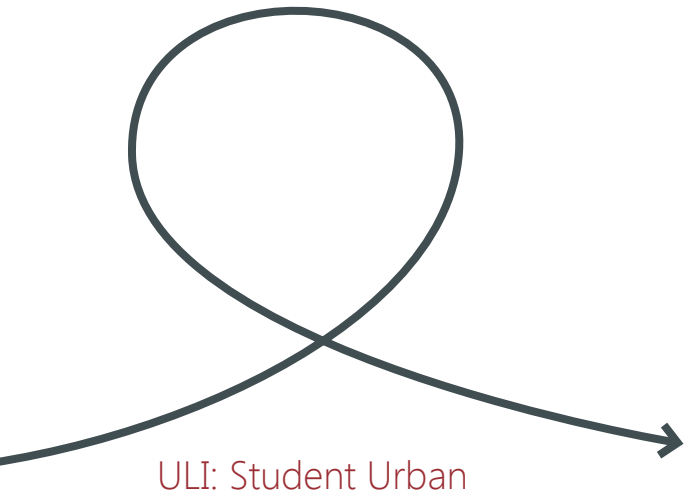


FIGURE 0.01: Driving Forces (Author 2014)

In the middle of this study, I was involved in an urban design competition (ULI) where I was able to apply the framework I had developed. This experience through me through a loop, but I was able establish early on that my current methodology was not effective in answering my research questions. In this way the design competition became another driving force of my project, pushing me to develop the project and framework further into a design approach.

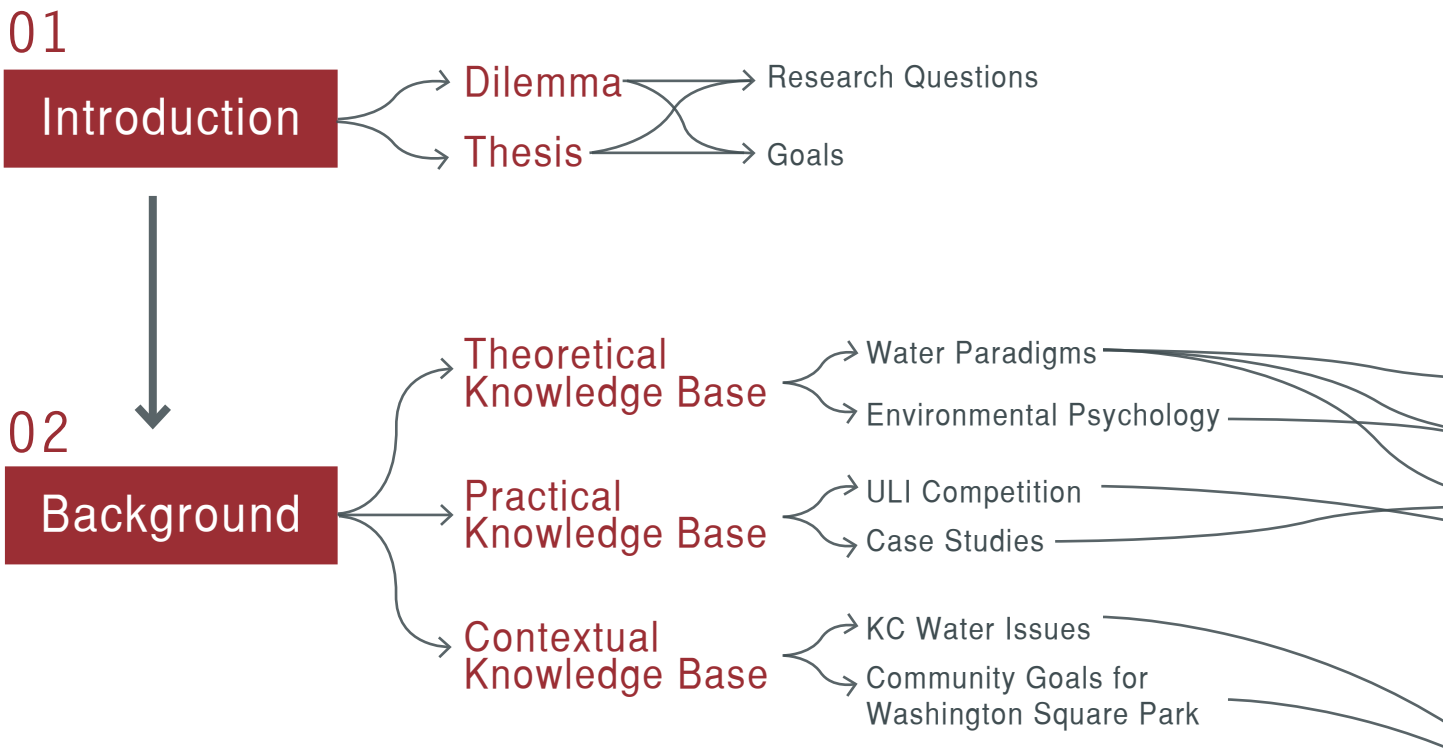


ULI: Student Urban Design Competition

Finally, the end goal of providing COEN with a valuable resource to use during their redevelopment of Washington Square Park, along with my personal learning goals before completing graduation, shaped the final outcomes of this project.

End Goals

- Provide COEN + Partners with a valuable resource to use in the redevelopment of Washington Square Park
- Gain a better understanding of water management issues and the role of landscape architecture in addressing them
- Graduate having explored psychology's role in the design process

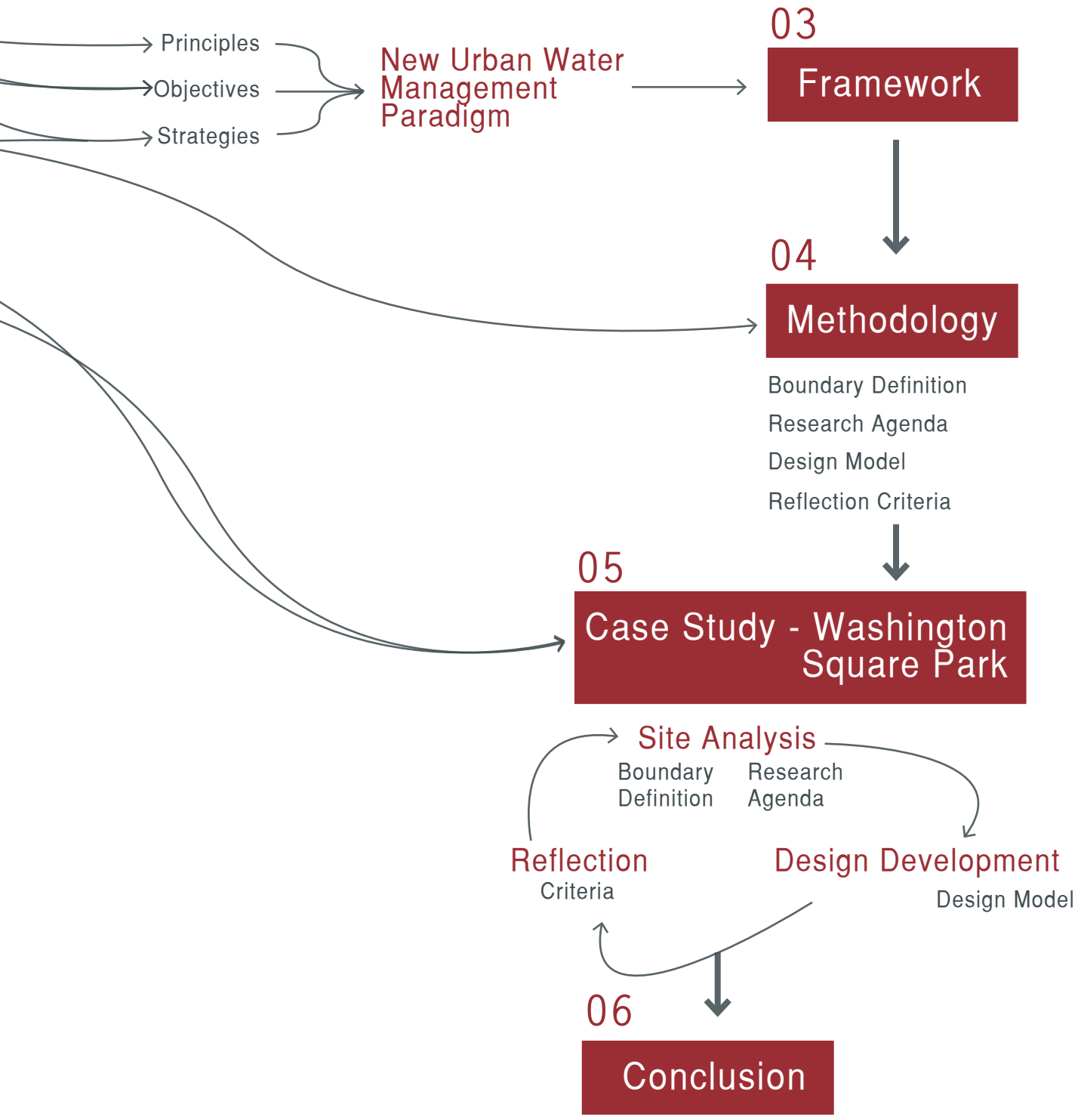


Project Process

FIGURE 0.02: Project Process (Author 2014)

Figure 0.2 illustrates the project process of *Towards a New Paradigm*. The project was founded in a primary dilemma and informed by theoretical, practical, and contextual knowledge.

During this iterative project process, all phases were revisiting and refined based on the new findings.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Chapter 1
INTRODUCTION

Section 1.1
Introduction

FIGURE 1.1: Sewer Lid (Pavlov 2011)

The way current society thinks about and develops with water resources is not sustainable (Mouritz 2003). These thoughts and actions embody a paradigm that does not value the ecological functions necessary to maintain the water quality and abundance necessary for future generations (ibid). Today's approach to water treatment typically follows a linear path of collect, single use, treat, and convey (Ahern 2010). This approach has led to issues that are reaching critical thresholds in cities today (e.g. of water scarcity, flooding or contamination). To solve these issues, cities must make steps towards a new approach to water management and infrastructure.

In order for cities to shift towards a more sustainable water infrastructure system, development projects must take into consideration their impact on hydrological functions - creating "water centric" communities (Ahern et. al. 2010). *Towards a New Paradigm* explores one scenario of how this paradigm shift can start in cities through landscape architecture based projects.

The shift to a new water management approach will take efforts from multiple fields of knowledge. Changes in societal mind sets, city policies, and approaches to development will take coordination and cooperation. With landscape architecture specializing in the design of spaces that produce environmental, social-behavioral, and aesthetic outcomes, this project makes the argument for landscape architects to take a strong role in leading the movement.

The fundamental challenge facing emerging water management approaches is societal mind sets about water. People have different perspectives and values. Those perspectives and values drive both rational and irrational decision making (Kollmuss & Agyeman 2002). For this reason, development projects must work to align social, ecological, and economic functions with societal and cultural values. However, having people agree on a mutual set of management values is a challenging task. Since individual perceptions differ, the acceptance and support of public projects could be determined by how the project

Sustainable Stormwater Management: an approach which shifts the emphasis on stormwater management from the heavily engineered "collect and convey" approach to one which relies on natural solutions to storage and treatment (Contextsensitivesolutions.org)

supports individual values and the immediate benefits they reap from the project.

This study reviews relevant literature on emerging urban water management approaches and synthesizes them to create a comprehensive framework of principles and objectives that embody a new water paradigm. Fundamentally, this new water paradigm is to be ecologically sound and desired by the public (Ahern et. al. 2010). However, there is a gap in the literature for objectively connecting ecological functions with social acceptance. This project proposes to close this gap by employing environmental psychology strategies in urban design, using them to motivate a shift in how society thinks about and handles water. This project appends "Motivational Aspects" to the traditional social, ecologic and economic aspects of sustainability to create the New Urban Water Management (NUWM) Framework. Within this project, NUWM is a holistic paradigm that is applied as a design approach to water-centric urban development.

This project focuses specifically on landscape architecture's role in catalyzing the adoption of the NUWM paradigm in Kansas City. Kansas City exhibits the central dilemma presented in this study - practicing under a flawed water paradigm of collect, treat, and convey.

The project presents the NUWM paradigm as a design framework, then translates that design framework into a design approach to water-centric urban development projects. A redevelopment project at Kansas City, Missouri's Washington Square Park functions as a case study in the application of the framework and design approach. The final design and planning strategies proposed for Washington Square Park demonstrates the efficacy of the coupled Framework and Approach in practice.

Management Paradigm: refers to a set of basic assumptions about the nature of the system to be managed, the goals of managing the system and the ways in which these goals can be achieved. The paradigm is manifested in artifacts such as technical infrastructure, planning approaches, regulations, engineering practices, models, etc. (Pahl-Wostl 2010).

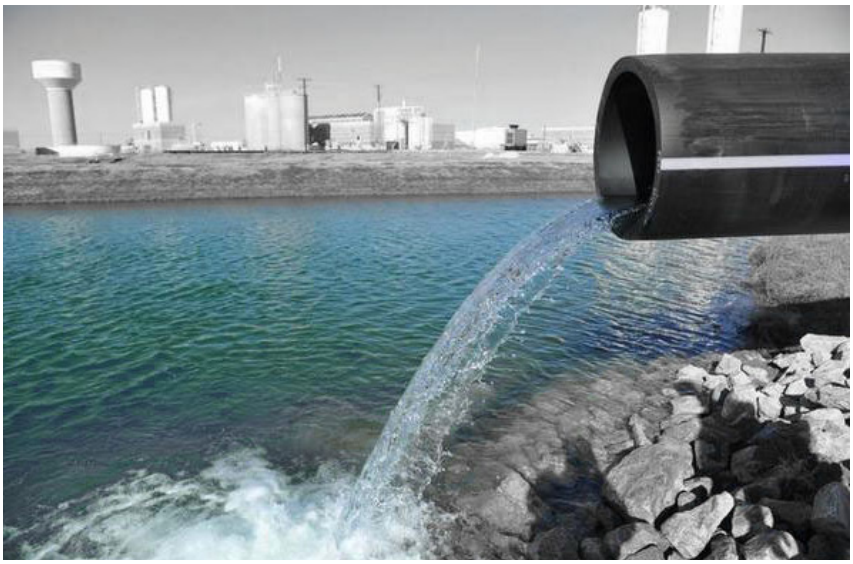


FIGURE 1.2: Water pipe (Halsey 2014)

Section 1.2 Dilemma

The primary dilemma addressed within this project is that the current way of thinking about and handling water is not sustainable. According to the 2012 Brundtland Report, "Sustainable" means to provide for today's needs without compromising those of future generations (WCED 1987). Stormwater and waste in general is seen as a nuisance in Western society's current water paradigm (Echols & Pennypacker 2008). It is treated in a linear manner; supply, single use, treatment, and disposal (Ahern et. al. 2010). This mismanagement of resources stems from and contributes to the mind set that water is disposable, and that ecological systems are lesser than and detached from human systems (Hopwood 2005).

Motivating communities to adopt the mind sets and practices of a new approach to water management serves as this project's second major dilemma.

Among other factors, ideals and perceptions of the community drive decision making regarding City water management projects (Becktel & Churchman 2002). Designers can begin addressing both dilemmas simultaneously, providing a new functional approach to water management, while using the physical amenities created within that approach as a marketing tool for environmental stewardship.

Section 1.3 Project Intent

This project addresses how landscape architects can shift the water paradigm in cities through motivational water-centric design. Motivational water-centric design persuades individuals and communities to act with a more integrated mind-set in their water practices and future development decisions.

The purpose of the project is not necessarily to convince communities to live and develop sustainably out of an altruistic concern for the earth, or even future generations, or to elicit specific sustainable practices from individuals. The argument of this study is that urban design can reveal to people that living and developing sustainably has multi-beneficial outcomes that affect currently held social and cultural values.

This project focuses on changing how people think about water and their relationship to it by changing the way water is managed and designed within cities. This is based on the rational that our mind sets, values and attitudes influence the way we make decisions, and that community and stakeholder's decisions drive the way cities develop (Bechtel & Churchman 2002).

According to the Electric Power Research Institute (EPRI 2009), two things are necessary in order for cities to shift from the old water paradigm to a new water paradigm: 1. Public demonstration projects that lead by example 2. Social marketing strategies that promote the adoption of the new paradigm into the community (EPRI 2009).

The study of environmental psychology will provide this project with an understanding of how environmental factors can be optimized through design to persuade people to action. "Environmental psychology is a field of study that examines the interrelationship between environments and human affect, cognition and behavior" (Bechtel & Churchman 2002, 12).

This project provides a Framework, Design Approach, and Case Study design as methods to investigate how landscape architecture projects can embody and promote water-centric development in cities. The first step

to instigating this paradigm shift is to define the paradigm in terms of its principles, objectives, and strategies. These are drawn from literature on water paradigms and environmental psychology, personal experience designing with the paradigm principles, and case studies on projects that employ water infrastructure strategies as social amenities. The knowledge synthesized from these sources create what this project calls the New Urban Water Management (NUWM) paradigm, or approach. This approach is then translated into a Framework. This Framework guides in creating a Design Approach for projects aiming to embody and promote the new paradigm defined by the Framework.

This project uses Washington Square Park, a public site in downtown Kansas City, Missour, as a demonstration for how to develop within the NUWM paradigm. This demonstration project employs lessons learned from environmental psychology to communicate to visitors how this type of development is not only ecologically beneficial, but also beneficial to their personal values and community goals.

Many NUWM principles and objectives can be accomplished through socially programmed green infrastructure. This project identifies appropriate green infrastructure strategies for Washington Square Park and its associated watershed. This process is guided by sustainable stormwater management literature and personal past experience designing developments using NUWM principles.

This project has three final products. The first is a Framework that defines the NUWM paradigm; second, a Design Approach that applies this framework as a three step design process; and third, a Case Study that applies the Framework and Design Approach.

1.3.1 Overarching Purpose

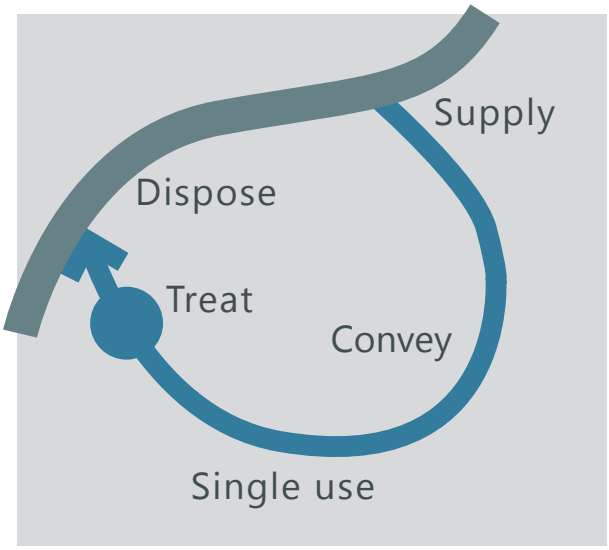
In order to promote the adoption of NUWM, this project investigates how site design can engage, educate, and elicit care in people. This approach allows users of the site to gain an understanding for the purpose and importance of water conservation and sustainable storm water management.

The Framework in this project presents environmental psychology strategies as an addendum to the traditional paradigm objectives to create a more motivationally effective design. This addendum of "Motivational Aspects" allows sustainable development plans to come full circle, creating designs that prompt citizens to understand the benefits of preserving and improving water as it pertains to their individual values. It is assumed that the more the community understands and cares about the issue, the more they will support future projects, and implement best practices into their own lifestyles.

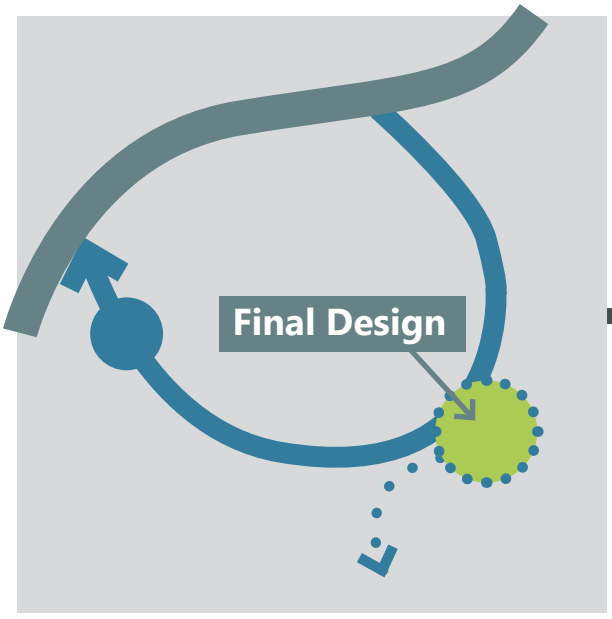
The practical purpose of this project was to work with my master's project group, H.E.R.D., along with students from the Kansas City Design Center, to contribute to COEN + Partner's redevelopment of Washington Square Park in downtown Kansas City, Missouri. This project was generated by a Request for Qualification/ Proposal (RFQ/P) prepared by the Kansas City Parks and Recreation Department. The individual masters' projects of H.E.R.D. address the RFQ/P in some form. Assisting COEN+Partners is among our collective research goals. Coen+Partners is the selected planning and design contractor for the site. The goal is that our efforts will assis them in their site analysis and/or design development of Washington Square Park. My individual project assists COEN in considering and designing for sustainable stormwater management solutions.

According to the NUWM paradigm, these sustainable solutions should consider the current social and ecological fabric of a place, mimicking the site's natural historical functions. They should also motivate sustainable actions in the community and individuals beyond the site. The data collected and analyzed in this project provides COEN with the rational and knowledge to incorporate NUWM solutions at Washington Square Park. These solutions are defined by their synergetic interactions between ecological, social and motivational performance.

KANSAS CITY NOW



WASHINGTON SQUARE PARK REDEVELOPMENT



FUTURE WATER INFRASTRUCTURE SYSTEM IN KANSAS CITY

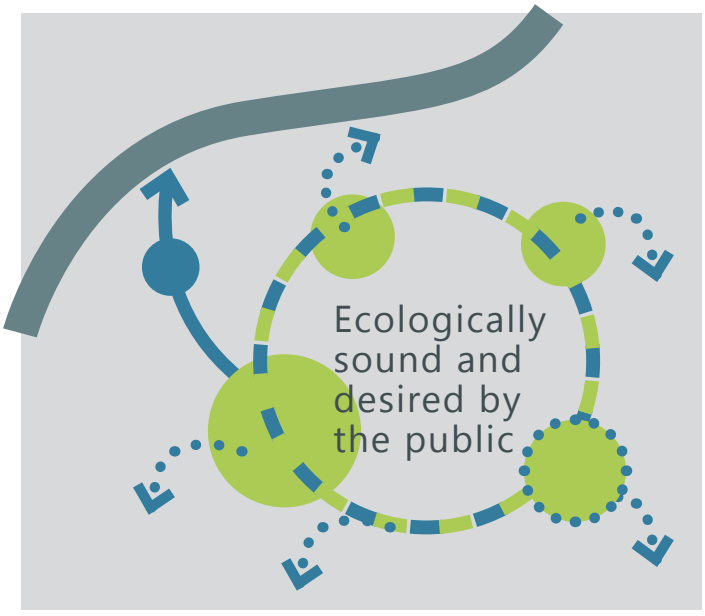


FIGURE 1.3: Project Purpose (Author 2014)

Section 1.4 Project Overview

1.4.1 Dilemma Demonstrated in Kansas City, Missouri

- Increasing amounts of development (and impervious paving), combined with an aging combined sewer system has caused flooding in downtown Kansas City. These issues have solicited a mandate from the EPA to address the problem (City of Kansas City 2009).
- While the city's goals support a new approach to water management in Kansas City, including green infrastructure and multi-beneficial solutions, current plans for the most affected area, Turkey Creek Basin, follow the path of the old paradigm: collect, treat, dispose.

In order for Kansas City to become a "Top Green City," as they desire, they must move beyond efficiency driven methods (City of Kansas City 2011). They must begin motivating the community to care about how their actions and development practices are affecting water resources, and begin the new paradigm of water centric developments and communities.

1.4.2 Thesis

Landscape architects can motivate and support the adoption of the NUWM paradigm in communities by leveraging cities' physical and social contexts in the application of environmental psychology strategies to stormwater management projects.

1.4.3 Research Questions

- What is the next urban water management paradigm? How should we think about and approach stormwater management now and in the future, both as a society and as landscape architects?
- What landscape architecture based design approach could lead to a development project that embodies the new paradigm, eliciting individuals and communities to care about water issues, and supporting community goals and values?
- How can this design approach be applied to a redevelopment project at Washington Square Park in Kansas City, Missouri?

1.4.4 Project Goals

The project's goals guide the development and final products of the project. They were developed based upon preliminary research and involvement in my master's group H.E.R.D. and our commitment to COEN + Partners and the Washington Square Park site through the RFQ/P developed by the Kansas City Parks and Recreation Department.

- Further the new water paradigm discourse in Kansas City
- Work with KCDC to provide COEN a valuable resource for the redevelopment of Washington Square Park
- Provide a landscape architecture approach to realize a new water paradigm through design

Chapter 2
BACKGROUND

Section 2.1
Theoretical Knowledge Base

Kansas City needs to shift the way they think about and handle their water. The conversation over this needed shift is resonating around the world as cities continue to suffer from aging infrastructure, contaminated water, costly short-term plans, and flooding (Brown 2007). Experts in stormwater management and sustainability have given their opinion on what this new paradigm must accomplish in order to lead cities into an age that values all resources, and uses them in ways that have ecological, economic, and social benefits.

The first section 2.1.1, "Shifting Water Paradigms," uses literature to identify past and current paradigms. Issues with these paradigms are discussed, and a more suitable approach is suggested, which is referred to as the New Urban Water Management (NUWM) paradigm. The new water paradigms are described in the literature in terms of the principles and objectives accomplished within them.

The literature review first describes what the NUWM paradigm is, why it should be adopted, and how to facilitate the shift from the old paradigm to the new. Finally, gaps in what experts provide as the new paradigm are identified. Current proposed paradigms lack the motivational performance to shift societal mind sets, thus affecting how society makes decisions about and approaches water issues.

Section 2.1.4, "Filling the Gap," draws upon environmental psychology to fill in the identified gaps in the NUWM paradigm. This project uses environmental psychology to provide incite for how the motivational performance of projects and developments can be enhanced through the scope of landscape architecture. This section supports my argument for the need to motivate people to action, and identifies strategies for doing so.

2.1.1 Shifting Water Paradigms

Historical water paradigms emerged from a discourse within society driven by social, economic, and later, environmental protection interests (Ahern et. al. 2010). The first paradigm identified within the literature was solely driven by self-preservation and protection against enemies (Novotny 2009). This paradigm reigned until the Middle Ages, when water became considered as a source of disease (ibid)(Figure 2.1).

Within the second paradigm, sanitation concerns drove the economy to engineer vast systems for water and drainage. This paradigm swept European and American cities in the 1830s to 1870s, creating the traditional approach that is still seen today in centralized urban water supply, sanitation, and drainage systems (Mitchell 2006; Allan 2005). These systems dispel water underground, separating it from the public.

The industrial age continued to augment the disconnect, and was the driving force leading into the third water paradigm (Allan 2005). Led by an economically driven mind set, Americans viewed water as an "endless" supply, there to aid our nation's growth and development through industrial and agricultural efforts (ibid). Urban rivers provided the power, water, and navigation that drove the industries. Later, as water bodies became heavily polluted, concerns about the environment emerged (ibid). Despite this concern, within the fourth paradigm period, systems still operate on the premise of unlimited water availability. Water analyst "Tony" Allan states that we are still living in this period, and desperately need to make the shift into the fifth paradigm (Allan 2005)(Figure 2.1).

The call for a "paradigm shift" started in the early 1990's, based on the premise that conventional water treatment and discharge systems cannot be sustained in the long term (Mouritz 2003). This projected paradigm has been called many things by experts. The "Fifth Paradigm," the "Holistic Paradigm," and the "Integrated Paradigm" are terms prevalent in the main body of literature describing the need and nature of a new water paradigm (Ahern et. al. 2010; Allan 2005)(Naveh 2007).

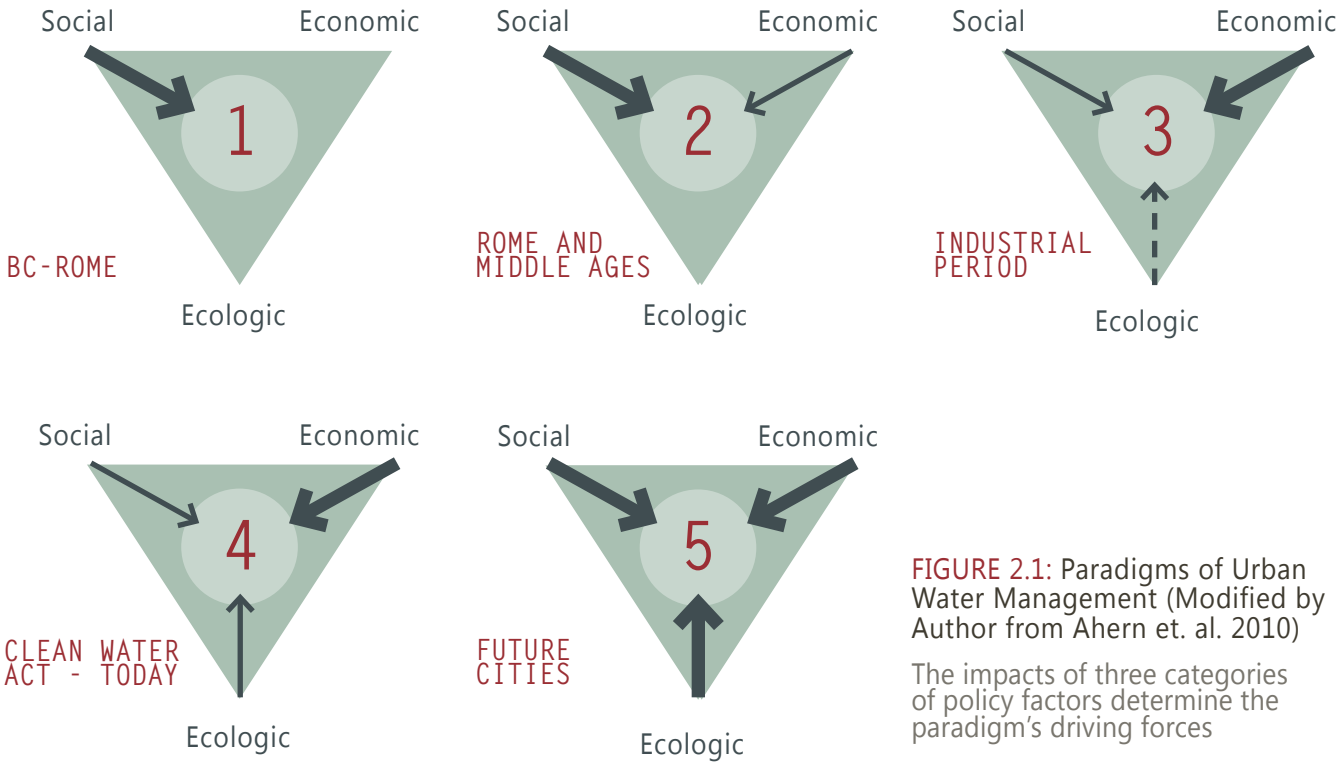


FIGURE 2.1: Paradigms of Urban Water Management (Modified by Author from Ahern et. al. 2010)

The impacts of three categories of policy factors determine the paradigm's driving forces

The discourse over a water management paradigm shift is at different stages in cities around the world. Due to America's comparatively newer sewer systems and higher reliance on technology, progress in the water paradigm shift is likely slower in North America. This project refers to the current situation of water issues in American cities, specifically Kansas City, when speaking about water paradigms and approaches in the remainder of the paper.

Current Practice

"Discussions among experts in the worldwide literature have concluded that the present paradigm of urban water and landscape management is neither sustainable nor resilient enough to accommodate climatic changes." (Ahern 2010, 19)

Society's current water management paradigm (Allan's described "Fourth paradigm") treats water in a linear manner. The current linear approach follows a pattern where water is extracted, treated to potable standards, typically used once, conveyed through pipes to a treatment plant, treated to high levels again, and disposed of as wastewater (WERF 2010). The reality of this paradigm is that "after 40 years of extensive infrastructure building programs and hundreds of billions spent, the goal of the Clean Water Act have not been met" (Ahern et. al. 2010, 65). Many issues stem from this current approach. Ecologically, this method reduces stream flow (Brown 2007). Consequences of reduced stream flow include modified flora and fauna habitat and natural ecosystems, inadequate removal of contaminants from water, and increased energy and chemical usage to process potable water (ibid). Economically, this process is costly in terms of rehabilitating and replacing aging water infrastructure (Mitchell 2006; WERF 2010). In regards to public health and safety, typical engineered solutions such as pipes are also vulnerable to climate change and catastrophic events (WERF 2010). Socially, piping water underground disconnects people from water. Burying water underground likely augments the dilemma of water mismanagement, promoting the ideal of "out of sight, out of mind." This causes society's relationship with water to be rooted in the paradigm that natural systems are separate from socio-economic issues, viewing and using natural resources as waste (Hopwood 2005). This disconnected mind-set of human and natural systems is causing human systems to degrade natural systems (Brown 2007).

Society's ideals of water and their relationship to it effect how they handle it, and vice versa. The classic chicken and egg dilemma presents itself, begging the question of "Which came first, the flawed ideal or the destructive action?" This project will avoid this conversation by presenting an approach to the dilemma that addresses both issues simultaneously. Figure 2.2 synthesizes the differences between the current practice and the new paradigm.

TOPIC	CURRENT PRACTICE	NEW PARADIGM
Water Use	Single use before disposal	Reclaim/reuse water multiple times
Water Quality Supplied	Treat all water to potable standards	Level of water quality based on intended use
Waste	Dispose	Recover resources
Stormwater	Convey off site	Harvest on site
Infrastructure Type	Primarily gray, centralized	Integrate gray and green through distributed approach
Infrastructure Integration	Drinking water, stormwater, wastewater management separately	Integrate as appropriate
Public Involvement	Stakeholders informed of pre-chosen solution	Stakeholders engaged in decision-making
Cost-Benefit Analysis	Focus on capital and recurring costs	Develop understanding of full cost and benefits
Solution Type	Large isolated technologies	System of various integrated technologies

FIGURE 2.2: Current water management practices vs practices under the new water paradigm (Ahern 2010; Mitchell 2006; WERF 2010)

2.1.2 Towards a New Urban Water Paradigm

This section identifies the core principles that constitute a new way of thinking about and developing water infrastructure. The sources use different terms to identify the paradigm; however, all define it in terms of principles and objectives. This section will inventory and synthesize the principles and objectives that embody the New Urban Water Management paradigm (NUWM), as defined by this project.

Findings from Sources

All the sources below explicitly use the notion of a paradigm for characterizing the underlying thinking behind approaches to water management. The examples differ in detail and emphasis but not in the essential elements of the nature of the proposed or anticipated shift (Pahl-Wostl et. al. 2010). This overlap reinforces the legitimacy of the principles extracted to define NUWM.

Mitchell, V. Grace. 2006. "Applying Integrated Urban Water Management Concepts: A Review of Australian Experience."

Mitchell defines a new water paradigm under the term Integrated Urban Water Management (IUWM). The basic idea behind the IUWM is that water infrastructure should minimize impact on the environment and maximize social and economic benefits.

Pahl-Wostl, C, P Jeffrey, and M Brugnach. 2010. "Maturing the New Water Management Paradigm: Progressing from Aspiration to Practice."

This paper summarizes the major arguments that have been put forward to support the need for a paradigm shift and the direction it might take. In conclusion, the paper starts pointing out the gap in the literature where contributions from psychology, which emphasize the roles mental models, can be usefully applied to paradigm change processes by motivating its adoption into communities.

Ahern, Vladimir, Novotny, and Paul Brown. 2010. Water Centric Sustainable Communities: Planning, Retrofitting and Building the Next Urban Environment.

This book describes concepts of a new water paradigm in terms of the "Fifth paradigm," and documents the "wide spectrum of technological advances that will contribute to the new paradigm" (Ahern 2010, p 19).

Feyen, Jan, Kelly Shannon, and Neville Matthew. 2009. Water & Urban Development Paradigms.

This book contains proceedings of the International Urban Water Conference in Heverlee, Belgium in 2008. This source presents various perspectives on different facets involving a new urban water paradigm.

Novotny, Vladimir. 2009. "Sustainable Urban Water Management." In Water & Urban Development Paradigms.

Novotny describes a new paradigm of integrated urban water based on the premise that urban waters are the lifeline of cities and the focus of the movement towards more sustainable cities. The paradigm considers microscale green infrastructures and links them with macroscale watershed management that mimics nature.

(WERF) Water Environment Research Foundation. Ternieden, Claudio, and Trevor Clements. 2010. "A New Paradigm for Sustainable Water Infrastructure: The EPRI/ WERF Report."

This report is the result of findings from WERF's Smart, Clean & Green – 21st Century Sustainable Water Infrastructure report and case studies analysis on a New Water Infrastructure Paradigm in 2009. This report synthesizes the principles into what they call the Integrated Resource Management paradigm.

EPRI. Palo Alto, CA, and Tetra Tech. 2009. "Sustainable Water Resources Management, Volume 3: Case Studies on New Water Paradigm".

The Electric Power Institute (EPI), a program within the National Decentralized Water Resources Capacity Development Project (NDWRCDP), also developed a document discussing the need for a new water management paradigm. This document is the result of a three day retreat organized by the EPRI where twenty-four experts from a variety of disciplines and organizations came together to define a new water infrastructure paradigm.

Synthesized Principles and Objectives

1. Multi-benefit Infrastructure Solutions

Infrastructure solutions can and should provide a multitude of benefits spanning the triple bottom line of environmental, societal and economic attributes (EPRI 2010; Mitchell 2006; WERF 2010; Novotny 2009; Ahern et. al. 2010). Borrowed from the Integrated Urban Water Managment (IUWM) paradigm, the primary aim of the NUWM is to "enable multi functionality of urban water services to optimize the outcomes achieved by the system" (Mitchell 2006, parag. 2). However, to truly optimize the outcomes of the system, the system must also motivate future adoption of the new development approach (Pahl-Wostl et. al. 2010). In order for the paradigm to take root, and be "accepted and desired by the public," which is the overarching goal of the paradigm, it must motivate citizens to adopt the paradigm in their lives and communities (Ahern et. al. 2010, 19).

2. Consider Context at Multiple Scales

Local actions can have implications at every scale and spectrum (EPRI 2010). Ahern states that the new paradigm should develop at an urban watershed scale in a way that mimics the site's historical ecological functions (Ahern et. al. 2010). At the same time, and an important motivational factor in the paradigm's adoption, is the consideration of socioeconomic boundaries when designing.

3. Balance and Consider Economic Costs with Social Benefits

Current water infrastructure management decision-making often relies heavily on quantitative factors such as capital and recurring costs. The new approach should look at the long range life cycle to evaluate water resource management decisions, taking into consideration the social amenities and environmental benefits provided by the development (EPRI 2010).

4. Mimic and Work with Nature

"These systems will both protect public health and safety and will restore natural and human landscapes" (EPRI 2010, 12). Ahern states that under the new paradigm, developing and retrofitting cities will integrate surface and underground drainage infrastructure and landscapes together (Ahern et. al.; WERF 2010). These systems will "store and convey water for reuse, provide ecological flow to urban flow-deprived rivers, and for safe downstream uses", and treat and reclaim polluted flows (Ahern et. al. 2010, 75). At the same time these systems will provide clean air, fresh water, and recreation space to the community (Brown 2007).

Suggested strategies for achieving these objectives include green infrastructure, stream restoration, reducing impervious surfaces, use of plants that retain water, LEED buildings, and decentralized management systems (Novotny 2009).

5. Distributed and Integrated Resource Management

A combination of infrastructure scales, from decentralized to centralized, green to grey, should be used appropriately (EPRI, 2010; Mitchell 2006; WERF 2010). Managing resources closer to the source of generation is often more efficient and provides greater opportunity for reuse (EPRI 2010). Replacing conventional central water systems with distributed systems pay more attention to environmental concerns by restoring receiving waters closer to the source (ibid). The main characteristics of water-centric developments and sustainable stormwater management are the replacement of conventional central water services systems by distributed systems (Feyen et. al. 2008).

6. Resource efficiency, recovery and recycling

"In addition to water, other waste-related resources should be used as efficiently as possible, while resources in waste should be recovered and recycled" (EPRI 2010). Consideration and promotion of changes towards sustainability in transportation, waste recovery, and all other silos that deal with the use and disposal of resources should be encouraged through the design (Feyen et. al. 2008; WERF 2010).

7. Integrate water management decisions with all aspects of community planning and development

All community decision-making must consider water. Valuing water and understanding that most infrastructure projects will affect the natural hydrological cycle means addressing these issues up front in planning and design phases (EPRI 2010; Mitchell 2006; WERF 2010).

8. Build Intellectual infrastructure

Communities need to foster and support research, development, and new ideas for water infrastructure management (EPRI 2010; WERF 2010).

9. Share responsibility and risk throughout the community

The process of informing and engaging stakeholders regarding water management should be transparent and inclusive. Stakeholders are engaged in the decision making process from the beginning. The open process is more likely to result in shared responsibility and risk (EPRI 2010; Pahl-Wostl et. al. 2010).

10. Adapt and Evolve

Emphasize flexible systems that can adapt and evolve over time (Feyen et. al. 2008). Communities need to implement management approaches that monitor performance so that progress toward goals can be assessed and alterations to the planning, design, and implementation process can be made as needed (EPRI 2010; WERF 2010; Pahl-Wostl et. al. 2010; Ahern et. al. 2010).

2.1.3 Theoretical Knowledge Base Findings

There is a gap in the established literature for objectively Building Intellectual Infrastructure, Sharing the Risk and Responsibility of water management, and Adapting and Evolving (Figure 2.3). Essentially, the literature provided objectives for the paradigm to be ecologically sound, but not acceptable by the public; thus, missing its main objective in this project for guiding designs that serve as catalysts for future water-centric developments.

For these reasons, it is critical to find objectives that can be executed within the realm of landscape architecture that address these principles and bridge the gap between hydrological functions and their perceived social value.

Principle: A fundamental quality or attribute determining the nature of something

Objective: specific result that a system aims to achieve; serves as the basis for evaluating performance

Strategy: A plan of action or policy designed to achieve a major or overall aim

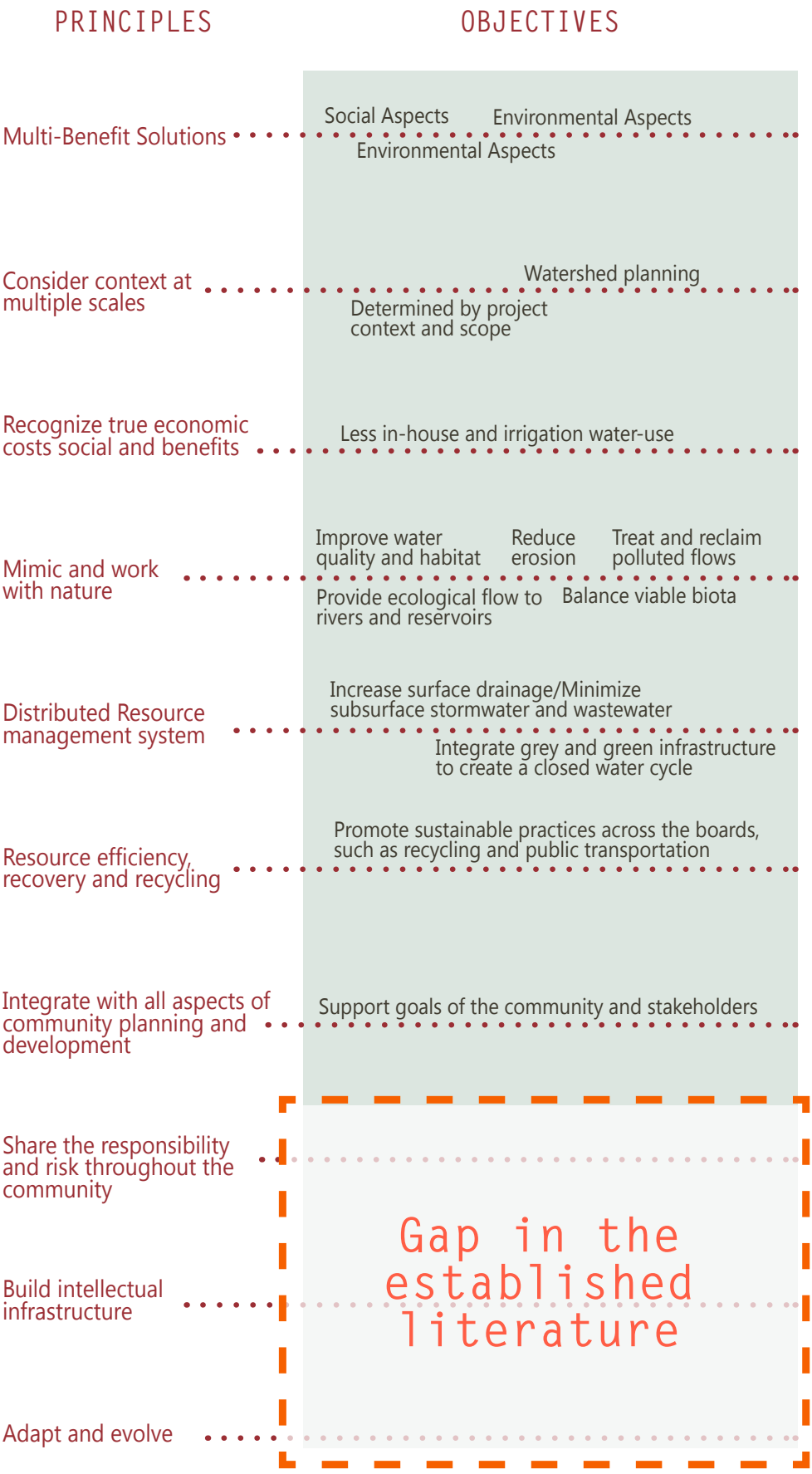


FIGURE 2.3: Gap in the NUWM Paradigm (Author 2014)

2.1.4 Filling the Gap: Environmental Psychology

This project establishes the need for a paradigm shift as well as provides evidence that this shift has begun within the professional discourse. While efforts to translate the discussion into practice has begun, progress is still slow (Pahl-Wostl et. al. 2010). Claudia Pahle-Wostl of Stockholm University attributes this slow progress to reservations in society about the value and benefits of the new paradigm and to the inability of management systems under the new paradigm to communicate its benefits to the community (Pahle-Wostl 2007). Pahle-Wostl states that "a paradigm shift requires processes of learning and communication across paradigm boundaries" (Pahle-Wostl 2012, 852). Other experts who recognize this gap in discourse to practice are asking the question "What tools are at our disposal for supporting these processes?"

The answer to that question can take many forms, from policies, to incentive programs to what the EPI suggested, marketing strategies. However, none of these solutions consider the development project itself as an education and communication tool. Furthermore, no proposed solutions are within the scope of landscape architecture.

This project uses environmental psychology strategies in the same manner and for the same purpose as marketing techniques. The following section elaborates on environmental psychology and its potential to serve a role in the water paradigm shift in Kansas City and beyond.

The Minnesota Pollution Control Agency (MPCA) has developed a preliminary list of environmental design strategies for eliciting sustainable behavior (Figure 2.4). This study offers the insights of psychology to identify methods for landscape architects to motivate the adoption of a new paradigm shift through sustainable water-centric development.

An in depth review of key environmental psychology literature was conducted, supported by recent article reviews. The information from these sources were reviewed and selected for further discourse based on their applicability as urban design strategies, and potential relevance to site design and

"There will be no environmentally sustainable cities until urban ecology, economics and sociology are factored into city planning. The achievement of this goal depends on motivating citizens." - (Rogers 1997, 32).

stormwater management projects. The objectives described below were translated as so from the literature review. Each objective includes a brief review of the literature that provided the theoretical support for the objective, followed by strategies for how to accomplish that objective through spatial and/or programmatic environmental design.

1 Make sustainable behavior the social default

- Communicate normative information
- Provide opportunities for people to demonstrate sustainability
- Create and nurture networks that spread sustainability
- Break down bystander confusion

2 Emphasize personal relevance

- Understand your audience's world view
- Find a new frame
- Focus on local issues, local effects

3 Make a hidden information visible

- Overcome perceptual barriers
- Build feedback loops with information or social feedback

4 Foster mindfulness

- Engage thinking with something surprising
- Encourage alignment with personal values
- Focus on improvement, not perfection

5 Create opportunities for competence, skills, and knowledge

- Give task-specific information
- Provide hands-on opportunities to try new behaviors
- Communicate effective actions

FIGURE 2.4: Environmental Psychology Strategies for Sustainable Behavior (Modified by Author from Manning 2013)

Synthesized Objectives from Environmental Psychology

1. Make sustainable behavior the social default

Humans are biologically programmed to care about what other people think (Manning 2013). This biological programming influences people to internalize and act on messages from other people, both explicit and otherwise, based on the kinds of behaviors perceived to be accepted by society (Manning 2013).

Values are responsible for shaping much of our intrinsic motivation. The question of what shapes our values is a complex one. A person's values are most influenced by the "microsystem", which is comprised of the immediate social net - family, neighbors, peer-groups, etc (Kollmuss & Agyeman 2002).

Social norms are the implied social rules that govern behavior within a community (Manning 2013). Norms develop over time as people observe how others behave, and how others react to their behavior. Social norms vary depending on the country, culture, and community.

People are looking for social proof that others in their community are engaging in sustainable practices (Cialdini & Goldstein 2004; Manning 2013). Once people see others behaving sustainably, or observe a trend in sustainable development in their neighborhood, they will feel as though these behaviors are the new norm, and engage in them (Cialdini & Goldstein 2004).

Applying the tip as a design strategy:

There are many ways of providing social proof. The first step in accomplishing this objective, for planners and designers, is to define the social group or community for whom you want to elicit action. Finding out the target audience's values can be achieved through surveys or more generally through understanding the demographics of the audience. This understanding will allow designers to make the message specific to some aspect of the audience's identity or personal concern (Manning 2013).

Bystander Confusion: a tendency for people in a crowd to not get involved as a response to other people not responding (Manning 2013)

The design should encourage positive social cues for the desired action, in the case of this project, sustainable water practices. These cues can be created by providing opportunities for people to demonstrate sustainable action publicly, or through physical and programmatic support networks that spread sustainable examples, and provide information about actions to prevent bystander confusion (Manning 2013).

2. Emphasize personal relevance

People make decisions based on their "worldview" or orientation (Manning 2013; Stern 1993). Stern expands on this notion, stating that everyone has an "altruistic" orientation, which they call "social orientation", an "egoistic" and a "biospheric orientation" (Stern 1993). The social orientation is concerned with the removal of suffering of other people, the egoistic orientation is concerned with the removal of suffering and harm from oneself, and the biospheric orientation is concerned with the removal of destruction and suffering in the non-human world. Every person has all three orientations but in different strengths. Stern proposes that environmental concern is caused by a combination of these three factors (Stern 1993).

It has been found that the egoistic orientation is the strongest orientation, followed by social and then biospheric concern (Stern 1993). Stern claims that the stronger the egoistic orientation, the stronger the motivation for the behavior. Schultz supports this theory, stating that appeals to altruism will almost always fail because they clash with the self-enhancing values and world views that the majority of Americans hold (convenience, independence, success)(Schultz 2003).

It is interesting to note that other incentives (e.g. economic advantages) and cultural values can motivate people to act pro-environmentally without doing it out of environmental concern. The egoistic orientation can be a motivator for pro-environmental behavior as long as the action serves the person's needs and wants (e.g. taking the train instead of the car to have time to relax and read)(Kollmuss & Agyeman 2002). However, some caution that unconscious pro-environmental behavior can easily be changed to a more unsustainable pattern because it is not based on fundamental values (Kollmuss & Agyeman 2002).

Applying the tip as a design strategy:

- Understand your audience's world view (Manning 2013). This can be done through surveys or other sociologically-based methods.
- Find a new frame; present the design as it benefits the communities values (Kaplan 2000)
    1. Personal finance
    2. Human health
    3. Moral obligation
    4. National security
    5. Social justice and human rights
    6. Economic
    7. Obligations to future generations
    8. National pride
- Focus and build upon local issues and efforts (Manning 2013)

"What we see is what we take care of" -Herbert Dreiseitl (ASLA, n.d.)

3. Make hidden information visible

Environmental awareness is "knowing the impact of human behavior on the environment" (Kaufmann 2012, 53). Environmental awareness has both a cognitive, knowledge-based component and an affective, perception-based component (ibid). Environmental awareness is constrained by several cognitive and emotional limitations (Kollmuss & Agyeman 2002). For one, most environmental degradation is not immediately tangible (ibid). We cannot perceive nuclear radiation, the ozone hole, or the accumulation of greenhouse gases in the atmosphere. Even changes that would theoretically be noticeable, for example the loss of species, often go unnoticed by the layperson. This is due to a time lag between the cause and effect of environmental degradation (Manning 2013). This time gap causes humans to perceive changes only after the damage has been done. This issue also causes emotional detachment from environmental issues because in most instances we must rely on secondary information about environmental destruction (Manning 2013). This emotional detachment leads to apathy at worst and bystander confusion at best (Kollmuss & Agyeman 2002; Kurz 2002).

Applying the tip as a design strategy:

- Overcome perceptual barriers - human perception is limited (Manning 2013). You can overcome these limitations by recreating the information missed by our senses in vivid images, actions or animation, graphic displays, or demonstrations.
- Build feedback loops with information or social feedback

4. Foster mindfulness

People who are in a more mindful state of awareness tend to act more sustainably (Manning 2013). Thus, increasing mindfulness is likely to also increase sustainable thoughts and behavior. Many studies have been conducted by psychologists on this matter. Their research has found that factors such as novelty and surprise increase awareness, and encourage people to think deeper about the subject (Bechtel & Churchman 2002; Manning 2013).

Applying the tip as a design strategy:

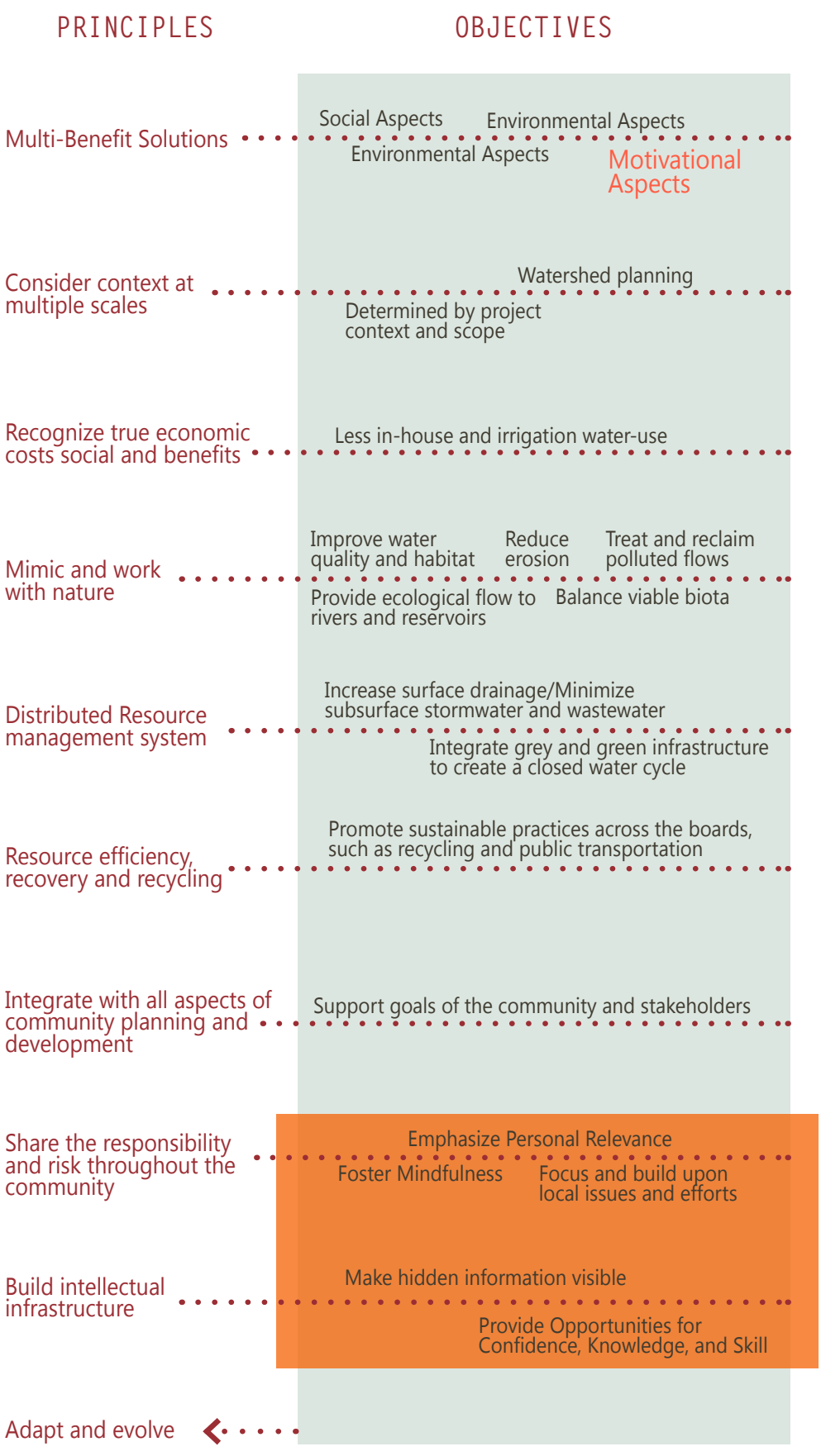
- Engage thinking with something surprising
- Encourage alignment with personal values

5. Create opportunities for competence, skills, and knowledge

People must possess a basic knowledge about environmental issues and behaviors in order to consciously act pro-environmentally (Bechtel & Churchman 2002). Whereas Kempton's study indicates that most people do not know enough about environmental issues to act in an environmentally responsible way, other studies have shown that very detailed technical knowledge does not seem to foster or increase pro-environmental behavior (Bechtel & Churchman 2002).

Applying the tip as a design strategy:

- Give task-specific information without going into detail
- Provide hands on opportunities to try new behaviors
- Communicate effective action


PRINCIPLES
OBJECTIVES
STRATEGIES
Multi-Benefit Solutions
Social Aspects
Environmental Aspects
Environmental Aspects
Motivational Aspects
Consider context at multiple scales
Watershed planning
Determined by project context and scope
Recognize true economic costs social and benefits
Less in-house and irrigation water-use
Mimic and work with nature
Improve water quality and habitat
Reduce erosion
Treat and reclaim polluted flows
Provide ecological flow to rivers and reservoirs
Balance viable biota
Distributed Resource management system
Increase surface drainage/Minimize subsurface stormwater and wastewater
Integrate grey and green infrastructure to create a closed water cycle
Resource efficiency, recovery and recycling
Promote sustainable practices across the boards, such as recycling and public transportation
Integrate with all aspects of community planning and development
Support goals of the community and stakeholders
Share the responsibility and risk throughout the community
Emphasize Personal Relevance
Foster Mindfulness
Focus and build upon local issues and efforts
Build intellectual infrastructure
Make hidden information visible
Provide Opportunities for Confidence, Knowledge, and Skill
Adapt and evolve
• Green Infrastructure
- Rainwater harvesting
- Rain gardens
- Grass filters
- wetlands
- ponds
- green roofs
- vegetated swales
- pervious paving
- infiltration trenches
• Retrofit and connect old underground systems interlinked with daylighted or existing surface streams
• Stream restoration
• Reduce impervious surfaces
• Interconnected surface water systems
• Decentralized management clusters

Environmental Psychology's Role in Catalyzing the Adoption of the New Paradigm

Integrating environmental psychology into the design process for implementing the NUWM paradigm allows water infrastructure to reach beyond functional benefits. As opposed to being an isolated effort, the project promotes future adoption of the NUWM paradigm principles in the community. This catalytic aspect of the development becomes just as important as the sustainable aspects, because no development can be sustained if it does not have the support of the community. In order for Kansas City, and other cities, to shift their water infrastructure systems into the new paradigm, the effort will have to be city wide, not just one project. However, one project can start the change if it gains the support of the community.

Knowledge from the field of environmental psychology addresses the initial dilemma of people not caring about water resources, or not fully understanding their integrated relationship with natural processes.

Environmental psychology sources aid in a better understanding of what motivates people, how people make decisions, how people are elicited to action, and what role spacial and programmatic properties have in those processes. Relevant information from environmental psychology was reviewed and communicated within this proposal through a set of objectives. These objectives inform a design approach that guides the final stormwater management design of Washington Square Park to motivate individuals and the community to think and behave with a more integrated mind set (Figure 2.5).

◄ FIGURE 2.5: Filling the Gap in the NUWM Paradigm (Author 2014)

2.1.5 Landscape Architecture's Role Within the Paradigm Shift

The new water paradigm is essentially a water centric approach to development. This approach requires the interdisciplinary efforts of planners, landscape architects, and experts in urban ecology, biology, and engineers (Ahern 2010).

Herbert Dreiseitl is an urban designer, landscape architect, and water artist. Dreiseitl's hallmark and specialty is the "inspiring and innovative use of water to solve urban environmental challenges, connecting technology with aesthetics and thereby encouraging people to take care and ownership for the places they live" (ASLA n.d.). Having written three books on the subject of water in urban spaces, Dreiseitl is thought of as a master on the subject. An interview conducted by the Association of Landscape Architects (ASLA) reveals Dreiseitl's thoughts on water paradigms, and where landscape architects can play a role in facilitating a stormwater paradigm shift.

Dreiseitl states that society's will to practice sustainable water habits is dwindling, as people are becoming more focused on their day-to-day needs, and ignoring long-term needs. This trend is not only occurring at an individual level involving environmental issues, but it is stemming into social and political issues. This attitude is detrimental to social and environmental foundations, as they are intertwined. "So what is needed is a paradigm shift," says Dreiseitl about water infrastructure. Dreiseitl goes on to describe his thoughts on how urban water infrastructure can be addressed by those in the design profession, such as landscape architects (ASLA n.d.).

Dreiseitl states that "Cities and urban areas have to change their systems into waterscapes...Water has to be decentralized, brought to the surface, and integrated into what we actually see. What we see is what we take care of" (ASLA n.d.).

When asked how innovations happening at the project level can be affective in the paradigm shift, Dreiseitl replied saying "Small-scale projects are good for creating

a sense of hope. They are good learning experiences that plant the seed for something bigger." Dreiseitl emphasized the importance of aesthetics within design in creating emotions of care and understanding. He puts the responsibility on designers for making cities more beautiful and functional, and in turn promoting care and encouraging progress towards a new paradigm (ASLA n.d.).

The EPI supports Dreiseitl with their strategies for facilitating the shift within cities. The first strategy is to build local demonstration projects to lead by example. The EPI's argument is that by demonstrating success within the community of these new stormwater management practices, an increase in public awareness is possible. Secondly, by using social marketing techniques, a city can further increase awareness and support to sustainable water practice.

As stated in the previous section, this project uses environmental psychology strategies as a method for marketing the paradigm through the physical development to the community.

Section 2.2 Practical Knowledge Base

2.2.1 Gerald D. Hines ULI Competition

Directly after completing the proposal for this project I was involved in a student design competition through the Urban Land Institute (ULI) - the Gerald D. Hines Competition. The ULI competition is multidisciplinary and open to graduate students from the U.S. and Canada. Teams of five enter, each consisting of at least three disciplines. The competition is two weeks long, and in that time teams are to develop a financially comprehensive design and development program for a real site. Being an urban design competition, the sites are usually district sized. My experience with this competition was hugely impactful to the rest of my project. At this point in developing *Towards a New Paradigm*, I had just compiled the preliminary list of NUWM principles and objectives. Through that list, I had a basic understanding that many of the objectives could be accomplished through socially programmed green infrastructure elements.

Myself and a classmate, Elizabeth Decker, decided to enter the competition the summer before starting our senior year and master's report projects. Throughout the Fall semester, a small group of students also interested in participating in the competition met to discuss the competition and urban design.

From this group of Kansas State University students, myself, Elizabeth, Mitchel Loring (Planning), and Lindsey Telford (Architecture) formed a team. Later, real estate student from the University of Missouri Kansas City (UMKC), Michael Jenkins, was added as the final fifth member.

On January 14th, 2014, the first day of the competition, site information was released to the teams. The site for this year was a district just north of downtown Nashville, Tennessee called Sulphur Dell. After two weeks of designing, teams submitted their proposals in the form of presentation boards, financial pro formas, and written summaries (Figure 2.6).

While my team, Team 142356, did not end up making it into the final round of four teams, we gained a great deal of knowledge about collaboration, development, and resilient design for stormwater management. All three of these lessons affected the remaining course of my project.

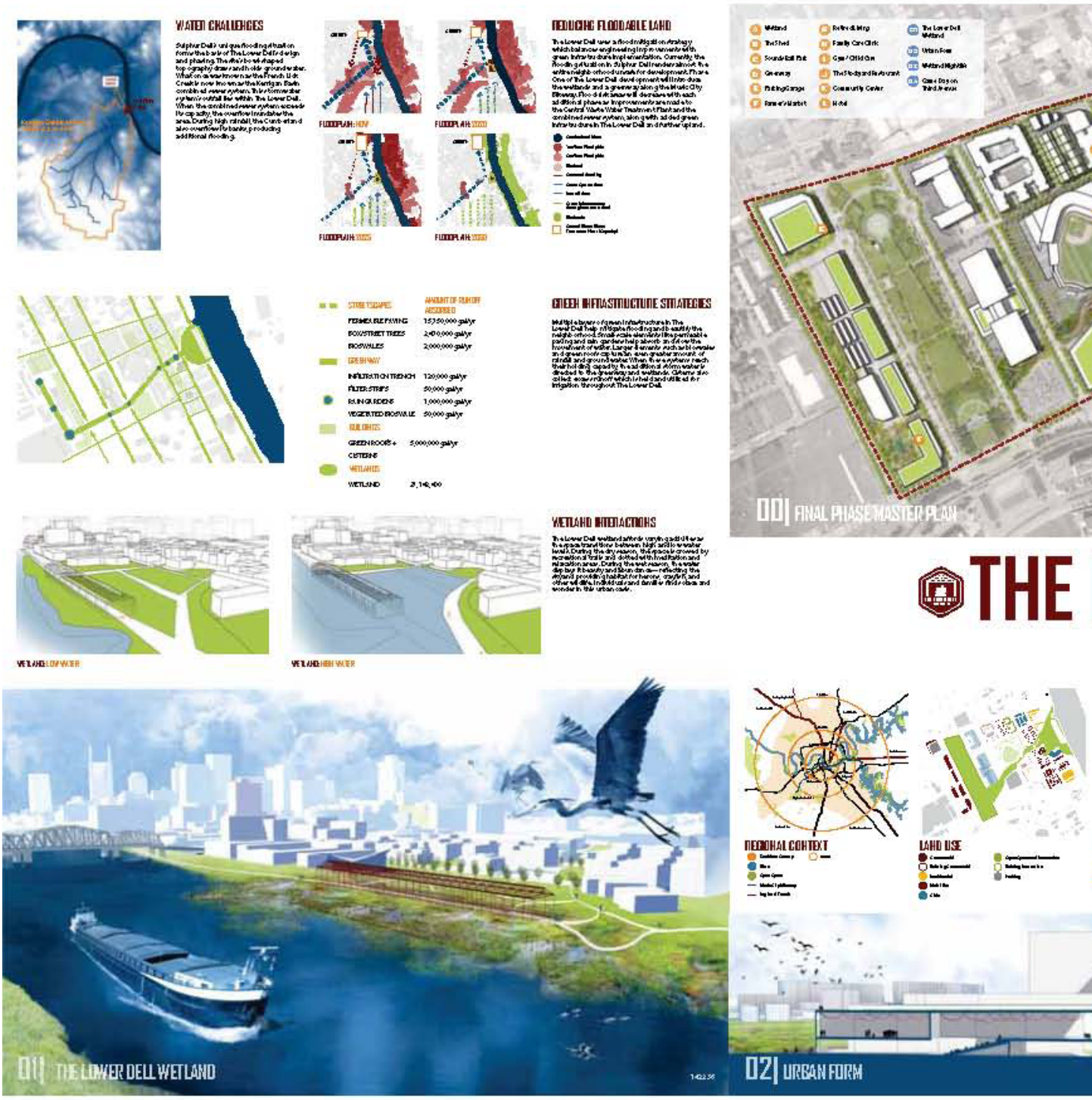
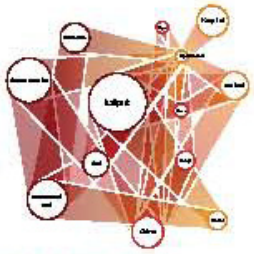


FIGURE 2.6: Team 142356 Final Submission Board (Team 142356 2014)



SOCIAL CONNECTIVITY

LOWER DELL

NASHVILLE IN BALANCE

PHASING : BALANCING WATER AND DEVELOPMENT

33.2% LEVERAGED IRR

$20,155,855 PROPERTY TAX INCREMENT

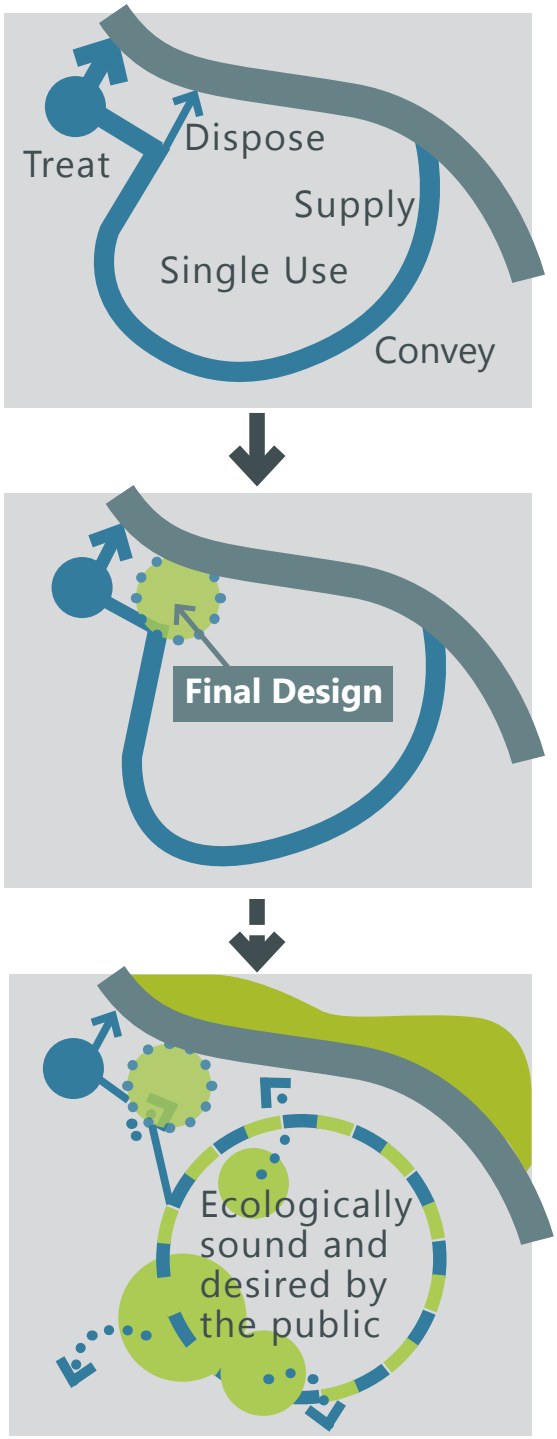


FIGURE 2.7: Impact of Lower Dell on Nashville's Water Management Practices (Author 2014)

Design Goals from Project Brief

After reading the competition brief it was clear that this project was directly related to my master's project. For that reason I became the design leader, using the NUWM Approach to water management and development to guide the design.

The stormwater management issues in Nashville reflects that of Kansas City, and the brief was clear to identify flood resilience and community health as top priorities for the redevelopment site. Therefore, our overarching goal was similar to that of my master's project, to create a demonstration project at Sulphur Dell that will serve as a catalyst for sustainable water practices in Nashville (Figure 2.7).

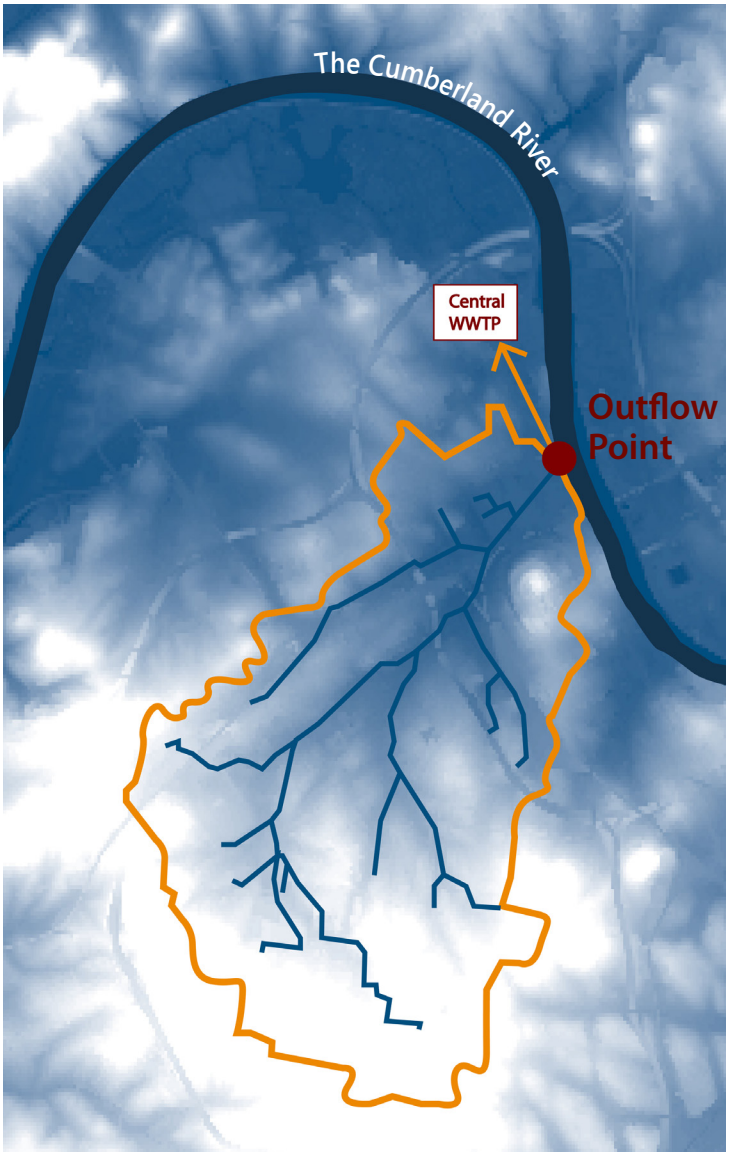


FIGURE 2.8: Hydrological Context of Sulphur Dell (Author 2014)

Dilemma

In 2010, Nashville experienced an immense flooding event which brought public attention to the issue of water management. Sulphur Dell has historically been susceptible to flooding from the Cumberland River and the French Lick Creek. The city's decision to pipe the French Lick exacerbated the situation by removing the resilient ecological functions of the natural stream. What once was known as the French Lick Creek is now known as the Kerrigan Basin combined sewer system. This storm water system's outfall lies within The Lower Dell (Figure 2.8).

The intense development upland from Sulphur Dell produces overabundant storm water runoff that is conveyed through the Kerrigan Basin combined sewer system (CSS), resulting in overflows and flooding the area. The site's bowl-shaped topography draws and holds ground water. This dilemma is compounded when the Cumberland also overflows its banks.

Sulphur Dell's unique hydrologic context forms the basis of The Lower Dell's design and phasing.

Design Solution Overview: The Lower Dell

The Lower Dell responds to the challenges currently facing Sulphur Dell and the Nashville metropolitan area. Flooding, creating profit for landowners, and the poor health of the region can be resolved when considered cooperatively. The Lower Dell is a model neighborhood for Nashville, balancing ecological, urban, and human health.

Aligning with the goals of the Metropolitan Government's Open Space Plan to protect the region's floodplains, wetlands have been created along the Cumberland and the Music City Bikeway. These wetlands balance ecological and urban influences to nurture human health.

In this mixed-use urban district, the electrifying atmosphere of a Sounds ball game coexists with the serenity of the wetlands. Buzzing restaurants, peaceful cafés, and local services front the tree-lined streets of The Lower Dell.

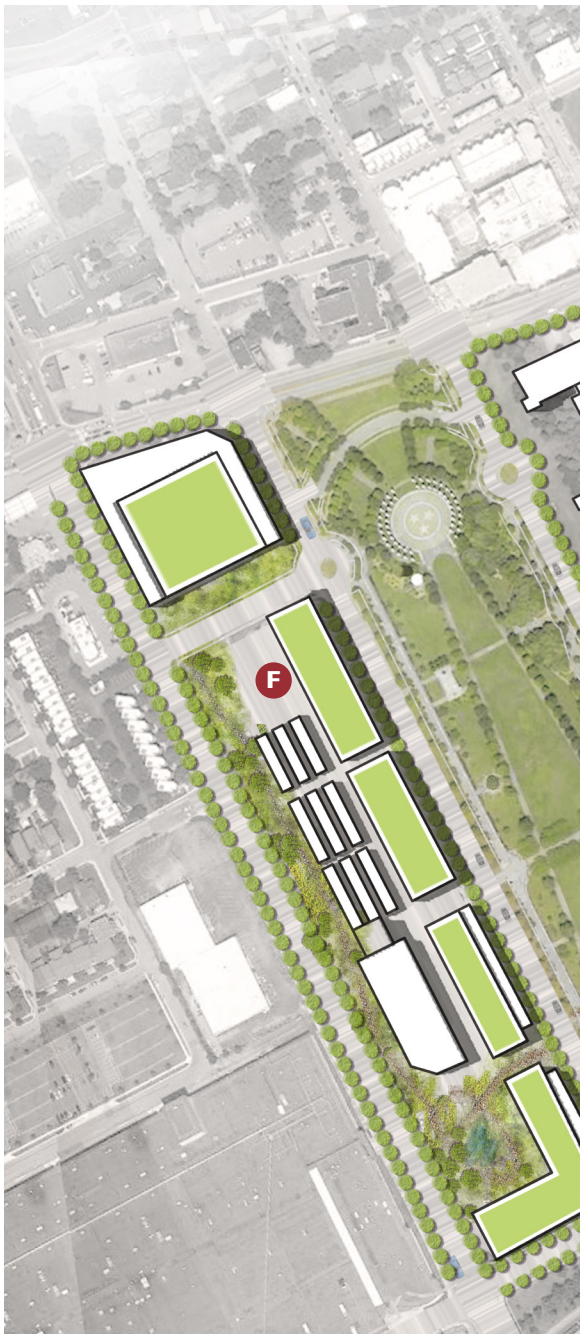
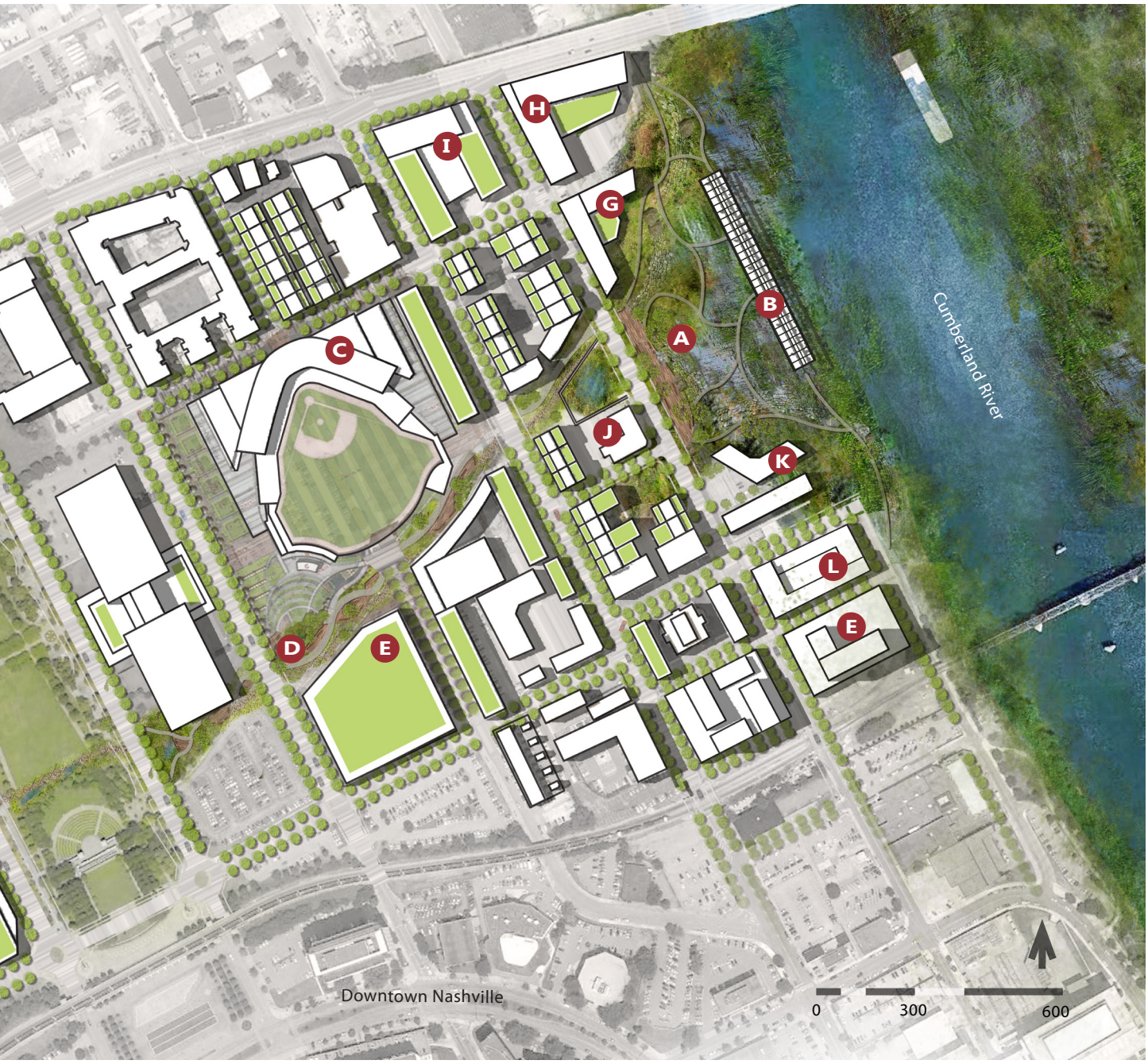


FIGURE 2.9: The Lower Dell Site Plan (ULI Team 142356 2014)



- A Wetland
- B The Shed
- C Sounds Ball Park
- D Greenway
- E Parking Garage
- F Farmer's Market
- G Retired Living
- H Family Care Clinic
- I Gym/Child Care
- J The Stockyard Restaurant
- K Community Center
- L Hotel

Circulation

Infrastructure improvements throughout The Lower Dell enhance the pedestrian realm, allowing people to actively move through the district. Local bus routes serve the neighborhood while regional transit connections, via Music City Central, are a few blocks away. Additional B-cycle stations are located on 3rd Avenue and bicycle facilities are found along every street. High connectivity affords a balanced range of social interactions in The Lower Dell—from large events, to friendly greetings along the lively sidewalks.

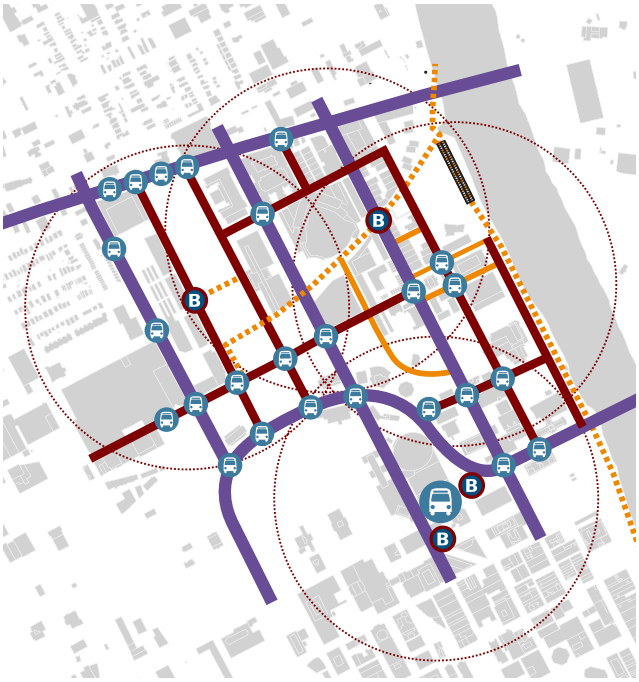


FIGURE 2.10: Circulation (ULI Team 142356

Green Infrastructure System

Green infrastructure elements are placed along the historical French Lick Branch, restoring the hydrologic functions (Figure 2.11). The drainage path is currently a pedestrian and bike path called the Music City Bikeway. The coexistence of the hydrologic functions and social exposure makes this green infrastructure system both a utility and a public amenity. Multiple layers of green infrastructure in The Lower Dell help mitigate flooding and beautify the neighborhood. Small-scale elements like permeable paving and rain gardens help absorb and slow the movement of water. Larger elements such as bioswales

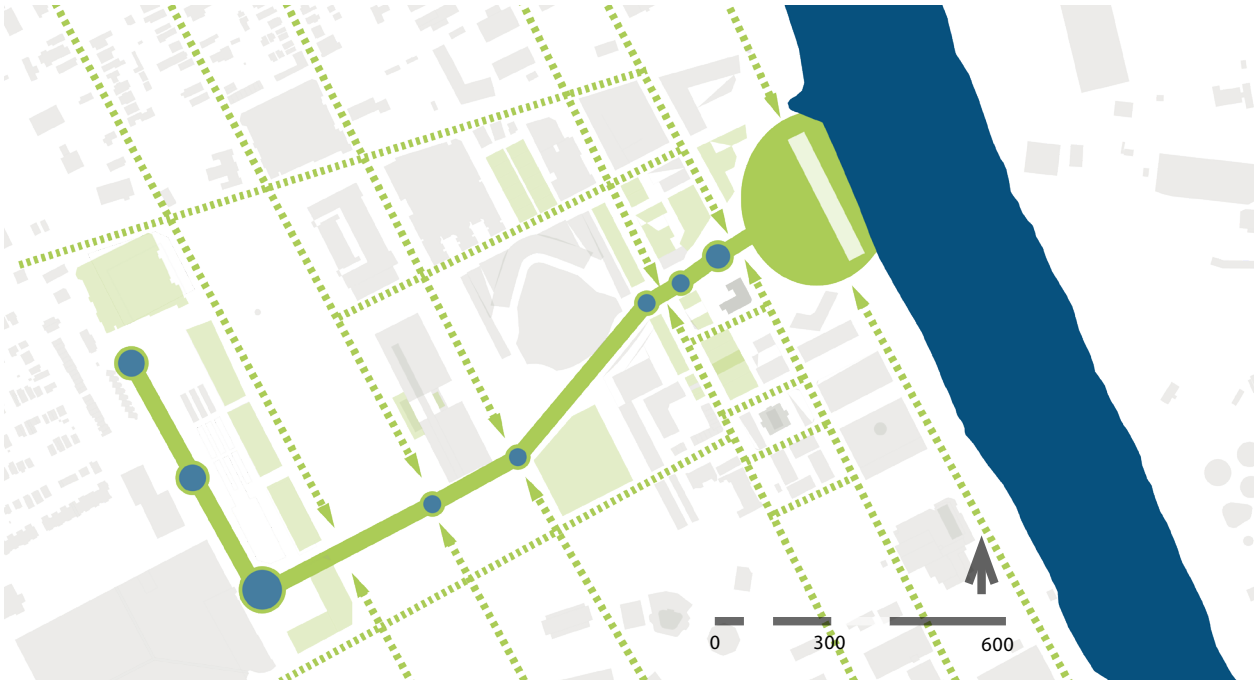


FIGURE 2.11: Green Infrastructure System
(ULI Team 142356 2014)

	RUNOFF ABSORBED
STREETSCAPES	
Permeable Paving	15,750,000 gal/yr
Box/Street Trees	3,470,000 gal/yr
Bioswales	2,000,000 gal/yr
GREENWAY	
Infiltration Trench	120,000 gal/yr
Filter Strips	50,000 gal/yr
Rain Gardens	1,000,000 gal/yr
Vegetated Bioswale	50,000 gal/yr
BUILDINGS	
Green Roofs + Cisterns	5,000,000 gal/yr
WETLANDS	
Wetland	37,143,400 gal/yr

and green roofs capture an even greater amount of rainfall and ground water. When these systems reach their holding capacity, the additional storm water is directed to the greenway and wetlands. Cisterns also collect excess runoff which is held and utilized for irrigation throughout The Lower Dell.

FIGURE 2.13: Using gray and green infrastructure to reduce floodable land (ULI Team 142356 2014)

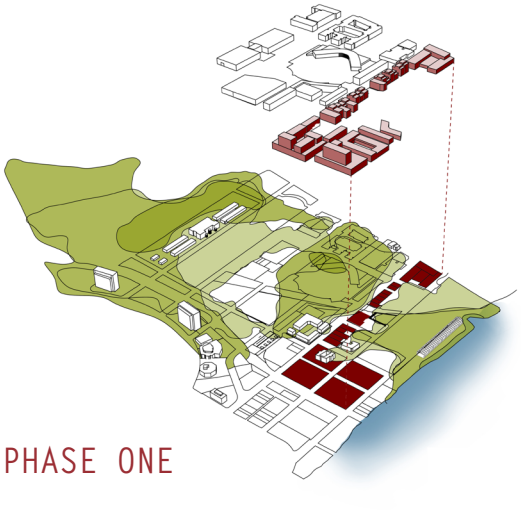


FIGURE 2.14: Phasing in development as flood plains recede (ULI Team 142356 2014)

Reducing Floodable Land for Development

The Lower Dell uses a flood mitigation strategy which balances engineering improvements with green infrastructure implementation. Currently, the flooding situation in Sulphur Dell renders almost the entire neighborhood unsafe for development. Phase One of The Lower Dell development will introduce the wetlands and a greenway along the Music City Bikeway. Flood-risk areas will decrease with each additional phase as improvements are made to the Central Waste Water Treatment Plant and the combined sewer system, along with proposed green infrastructure in The Lower Dell and further upland.

The development phasing of The Lower Dell balances the site's challenges with its opportunities. By building first in the parcels least vulnerable to flooding, immediate returns will be captured for the site while protecting investments already made in the

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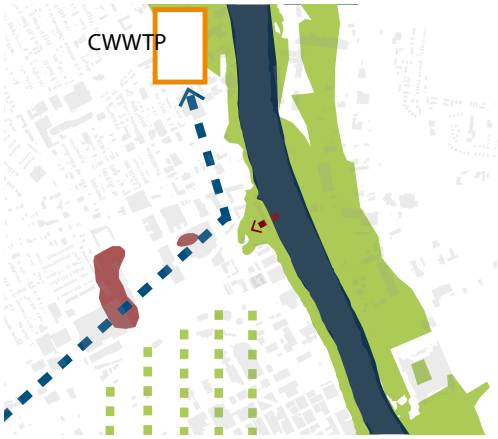

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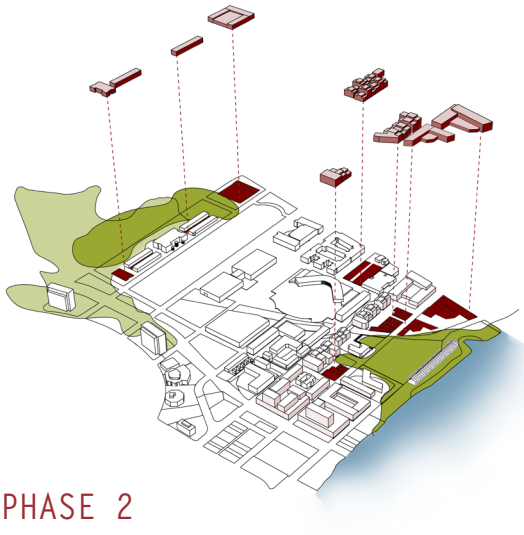
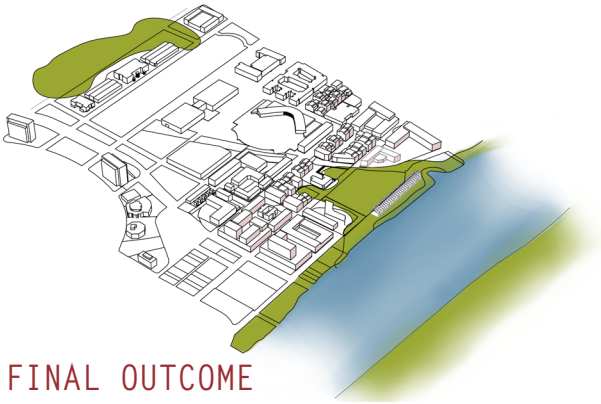


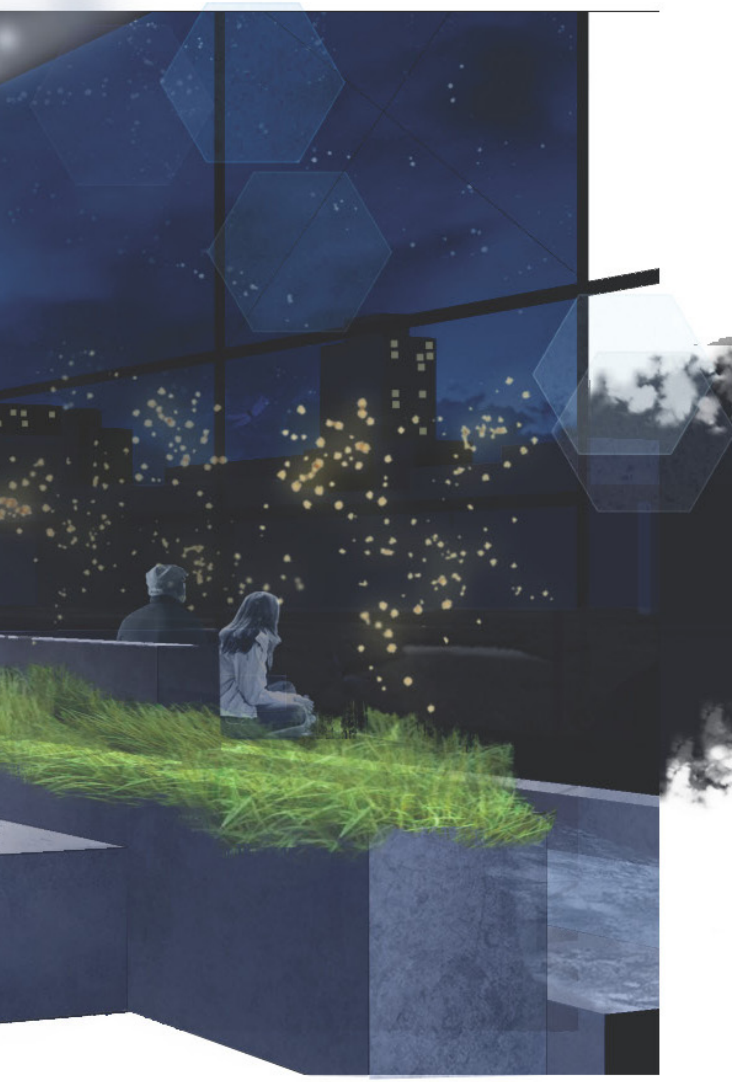
PHASE 2



FINAL OUTCOME

area. Second phase construction will begin in 2020, following the implementation of additional green infrastructure and improvements to the Central Wastewater Treatment Plant. Waiting to develop these parcels will increase land values due to a growing population, demand generated by the first phase, and a decreased flood risk.

FIGURE 2.15: Repurposed Industrial Shed at Night (ULI Team 142356 2014)



Fostering Mindfulness

Complementary to physical and social health, The Lower Dell also supports mental well-being. The tranquility of the wetlands offers an escape from the occasionally over-stimulating downtown. Paths connect meditation spaces and wind through the skeleton of the repurposed Iron Works building. The urban form provides soothing vistas of the wetlands from restaurants, apartments, and offices.

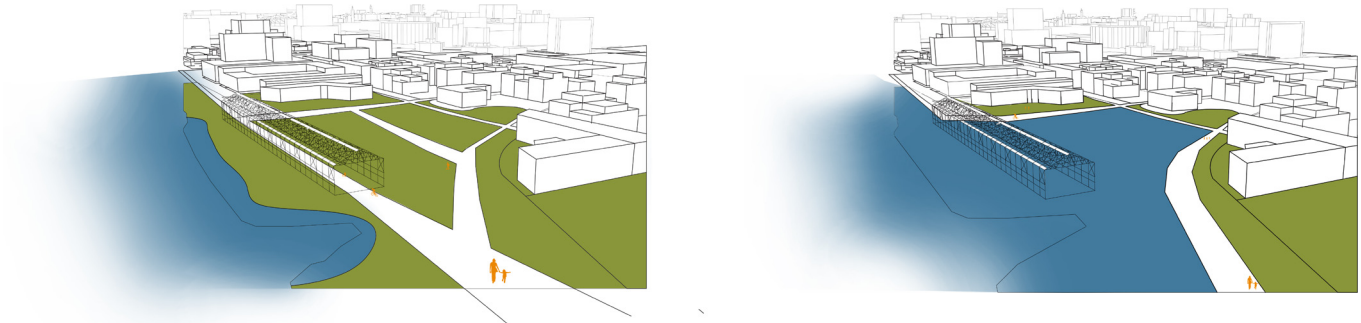


FIGURE 2.16: Adaptable Use of the Wetlands (ULI Team 142356 2014)

FIGURE 2.17: Lower Dell Wetland (ULI Team 142356 2014)

Adapt and evolve

The Lower Dell's urban character and wetlands balance each other, creating an environment which supports holistic human health. After this site demonstrates social, ecological, and economic potential, civic leaders in Nashville will apply the strategies introduced in The Lower Dell to suitable sites throughout the region. This natural, urban, and human balance is the foundation for a prosperous future Nashville.

The Lower Dell wetland affords varying activities as the space transitions between high and low water levels. During the dry season, the space is crossed by recreational trails and dotted with meditation and relaxation areas. During the wet season, the water displays it beauty and abundance—reflecting the sky and providing habitat for herons, crayfish, and other wildlife. Individuals and families find solace and wonder in this urban oasis.

Findings

It was concluded at the end of this process that a framework of principles, objectives, and strategies was not enough to lead a design to embody and promote a new water paradigm. As the designer, I felt that I needed more guidance towards how to achieve these objectives within the design process. The answer was clear—in order to design a water infrastructure system that embodies and promotes the new paradigm, the framework must be translated and embedded into the iterative design process. The details of this translation and the NUWM Design Approach is covered in the Methodology (Chapter 4).

Design brainstorming was done at both a collective and individual level. I was in charge of the water treatment system, while the others discussed spatial form, development strategies, and district identity. Water issues were weaved in, sometimes driving the decision making process. However, not all aspects of the site's hydrological context could be translated to each team member, as there were other critical design factors to think about. Upon reflection, I realize that my grasp of the NUWM paradigm was not fully mature. I did not view it as a holistic development approach, but rather guidelines by which to follow in order to produce a successful stormwater management project. This lead to a disconnect in our water treatment system and our urban development strategy.

Lessons Learned

1. Translate paradigm framework to a Design Approach

My experience designing with the NUWM paradigm principles in a design project allowed me to understand the true nature and potential of the paradigm as an approach to development. It was after the competition that I realized a set of principles and design guidelines alone are not effective tools for design. In order to be effective, these principles must be translated into the design processes of site analysis, design development, and reflection.

2. Green Infrastructure elements should be accessible, serving as a public amenity

During the design process, creating green infrastructure into a public amenity seemed like common sense. However; it should be noted and emphasized within the Design Approach, as it is the key to physically connecting the public to the hydrological functions of the design.

3. Elaborate on objectives involving community goals and values

The Lower Dell did not possess a high level of motivational performance. While City documents containing community goals were reviewed, the Lower Dell did not adequately consider the community goals for the site and downtown area. The community goals and values need to be prioritized, and integrated in with the goals and objectives of the framework to create community specific design guidelines

4. Define boundaries to be used during site analysis

While not deliberate at the time, our team's considerations of the site's context during the site analysis process was helpful in guiding social, ecological, and environmental findings (Figure 2.8-2.10). Aspects that the team did not consider while defining boundaries to our site analysis considerations was the physical extent of City development plans that would influence the development site. This consideration would be helpful achieving motivational aspects of supporting community plans.

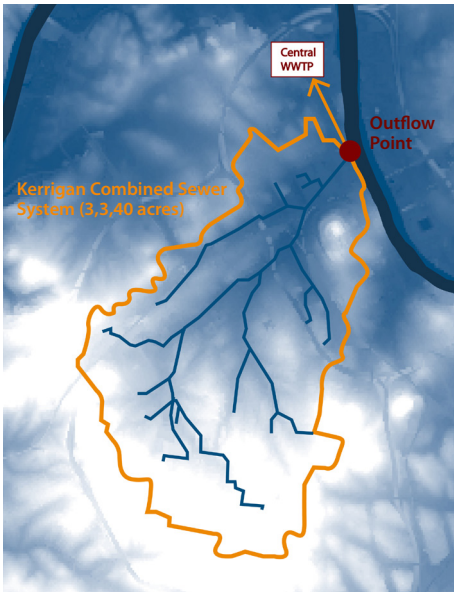


FIGURE 2.18: ULI Water Context Boundary (Author 2014)

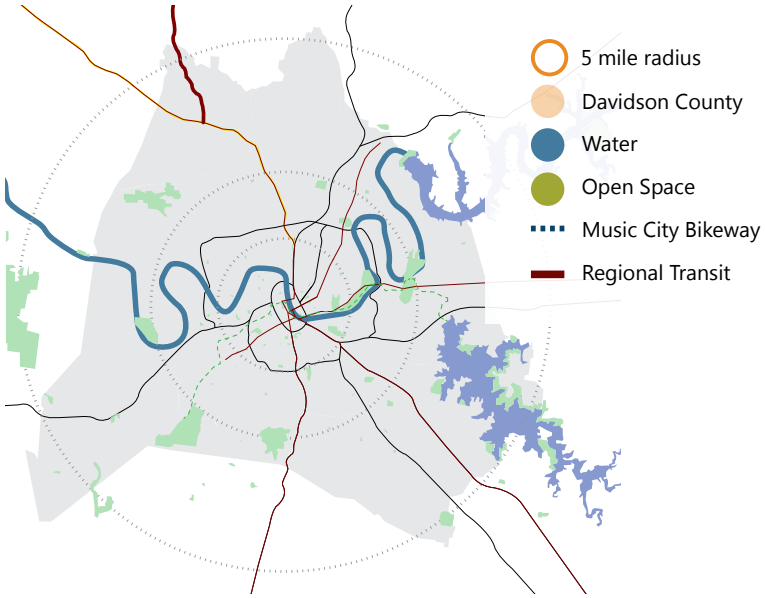


FIGURE 2.19: ULI Social Context Boundary (Author 2014)

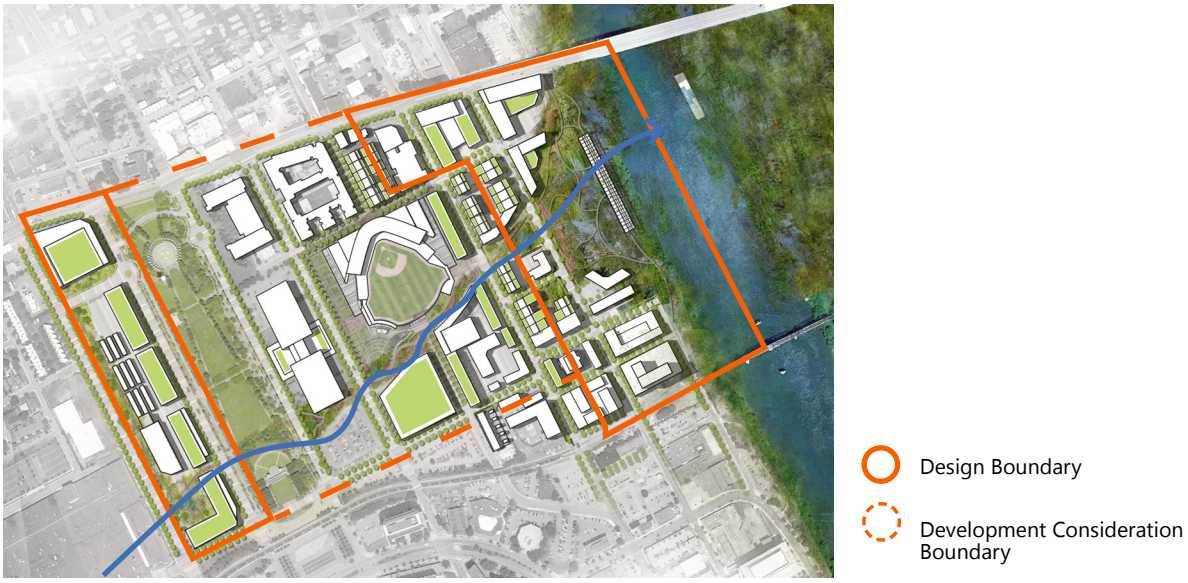


FIGURE 2.20: ULI Design Boundary (Author 2014)

2.2.2 Learning from Case Studies that Use Water as Amenity

After my experience with the ULI competition, I realized the need for a better understanding of how green infrastructure can be implemented as a public amenity. Making the stormwater elements accessible and useful must be coupled with motivational aspects in order for either strategy to be effective.

Pennypack and Echols have analyzed stormwater management case studies that begin to embody the new water paradigm. This study refers to the approach as "Motivational rainwater design." This article reports on projects in the USA that are integrating amenity and hydrological function in a holistic site design strategy that create awareness and positive perceived value of the project's water management system.

I reviewed their findings to investigate landscape architecture strategies for creating amenities from water infrastructure. Figure 2.12 provides potential strategies for interpreting the goals and principles of the new water paradigm into landscape architecture strategies. Echols chose to analyze designs that "result in greater user satisfaction and perceived value of the stormwater management techniques" (Echols 2008, 1).

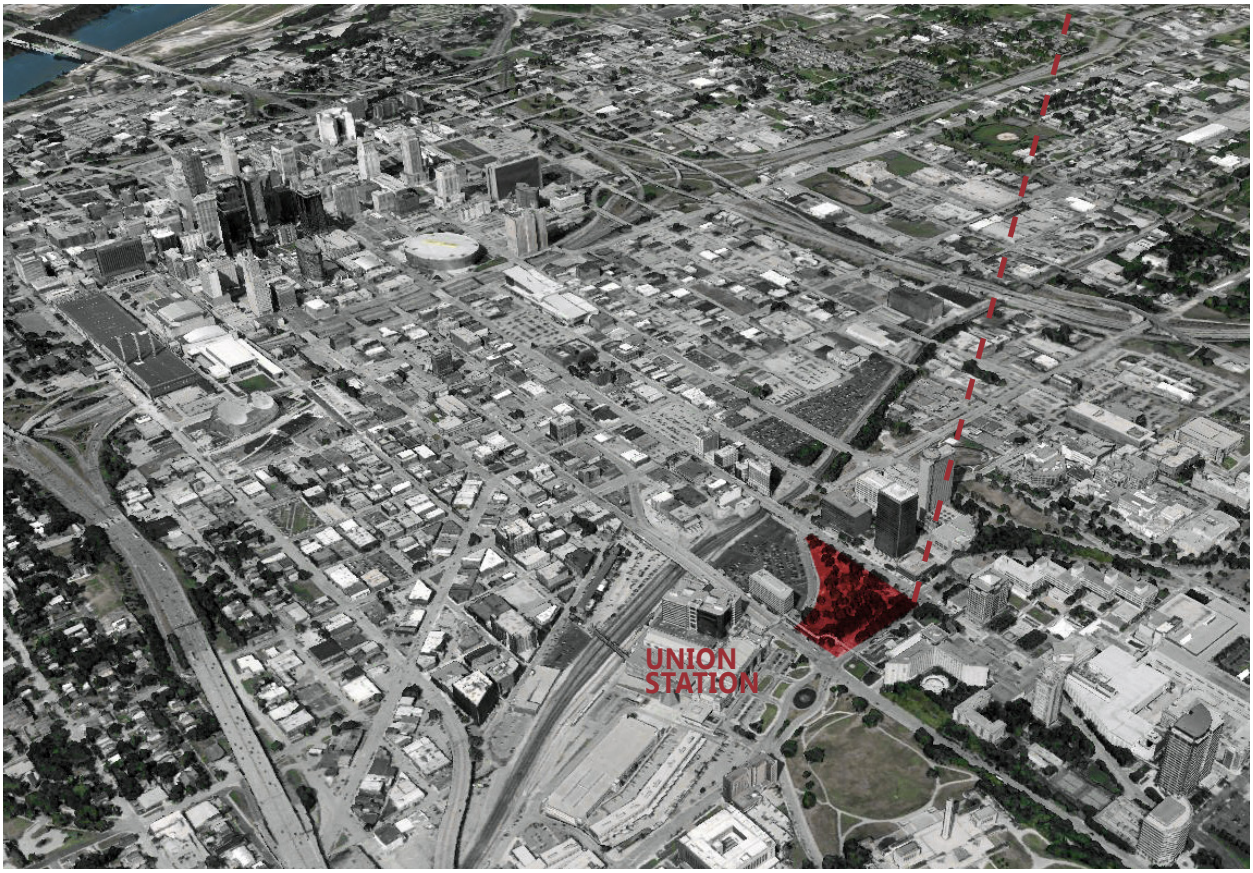
Pennypacker and Echols' study recognizes that on-site stormwater treatment systems can be designed as site amenities; that is, the rainwater itself becomes a feature that can engage, educate, and even entertain visitors. The authors use the term "Artful rainwater design" to describe this approach to stormwater treatment. Refer to Appendix B to review the methodology done by Echols and Pennypacker in developing their list of educational and recreational amenity techniques, and the case studies drawn from to develop the list.

In conclusion, designs will need to apply green infrastructure strategies as amenities, using environmental psychology strategies to expose their values to the community.

- Make the stormwater treatment system visible and legible
- Create a narrative of stormwater and the hydrologic cycle
- Make stormwater-related artifacts integral to design
- Create symbols of past watershed conditions
- Make the stormwater treatment system playful, intriguing or puzzling
- Include a variety of stormwater treatment systems in design
- Create systems that visibly collect and store trash and pollution
- Provide a variety of interesting wildlife habitats by using plants that provide wildlife food, providing different water depths, and creating shelter
- Provide simple signage or exhibits with brief text and clear graphics
- Design the stormwater treatment system to invite educational games or activities
- Create visual interest by varying the appearance of different parts of the stormwater treatment system
- Create a variety of spaces for groups to explore, gather or sit near the stormwater treatment system
- Create overlooks with views of the stormwater system
- Create destination points related to stormwater treatment systems
- Provide seating using walls, benches and /or tables and chairs with views of the stormwater system
- Provide paths in strategic locations that ensure encounters with the stormwater treatment system
- Connect on-side trails systems and destinations that ensure encounters with the stormwater treatment system
- Provide clear points of entry into the stormwater system that are visually inviting, mysterious and easily accessible
- Provide a variety of small and large places to play in or explore the stormwater treatment system
- Make areas that incite climbing and physical exploration that balance perceptions of safety with adventure
- Create systems that can be safely modified by the user such as small movable river rocks and weirs
- Create treatment systems that are touchable

FIGURE 2.21: Strategies for Designing Water Infrastructure as Amenity (Echols & Pennypacker 2008)

[2.22]



[2.23]

Section 2.3 Contextual Knowledge Base

While the purpose of this study is to contribute to the larger issues of a paradigm shift in how society views water, its focus is on a redevelopment project at Washington Square Park in downtown Kansas City, Missouri.

This section is used later to prioritize and expand upon the NUWM Framework into site specific design guidelines for Washington Square Park.

As previously stated, there is an opportunity to catalyze a new water management paradigm shift in Kansas City with the Washington Square Park project. Located within downtown, adjacent to high use areas such as Crown Center, Union Station, and soon to be terminus for KC Railcar (Figure 2.21-2.22). In addition, Washington Square Park is located in an area that is currently using a combined sewer system, and has good potential to make an impact on the city's efforts to alleviate sewer overflows.

FIGURE 2.23: View of Downtown Kansas City ("Downtown Kansas City Skyline" 2008)

FIGURE 2.22: Washington Square Park in Proximity to Downtown Kansas City (Modified by Author from Google Earth 2014)

2.3.1 Washington Square Park

Kansas City is a metropolitan area that straddles the Kansas-Missouri border. It is located at the confluence of the Kansas and Missouri Rivers. A large part of Kansas City's physical layout is rooted in the city's original urban planning done by landscape architect George Kessler (KCDC 2013). Kessler designed a system of boulevards, parks, and public space during the City Beautiful movement in the 1890s. While the entire plan was never entirely implemented, and has been altered through modern civic development, Kansas City still reaps the benefits of the fountains, park space, and strong axis that weave through the city's fabric. Part of Kessler's plan was Washington Square Park, which was designed in 1925 as a "key anchor park in the Kessler system" (KCDC 2013).

Washington Square Park serves as an entry point into downtown Kansas City. It was originally the "front lawn" to Union Station. The park has since been severed from its connection to the train station by Main Street. This disconnect has led to Washington Square Park's current status as an under utilized, under programmed park space. However, the site's location in downtown Kansas City still holds its planned potential as an anchor for the community. Plans to place the KC Railcar terminus on the site will increase its significance. The city has recognized Washington Square Park's potential, setting aside public funds for its redevelopment.

While Washington Square Park is significant in regards to its connectedness to downtown and social hubs (e.g. Crown Center and Union Station), its location is also relevant to the city's water issues. With a branch of Turkey Creek buried beneath it and plans for significant sewer infrastructure improvements just north of the site Washington Square Park has potential to play a significant role in Kansas City's future water management system (Figure 2.24).

Kansas City's history has always coincided with water. Throughout the city's history, water has been both a friend and a foe. Traditionally, water and development have been pinned against each other. The more the city develops and grows, the more impervious surfaces claim flood plains and hinder natural hydrologic functions. In the past, sewers and advances in technology have masked the issue, keeping water quality high and sewage out of the streets. However, the sewer system is reaching eighty years old, and Combined System

Overflows are contaminating the water and streets. Even when the system does work as intended, the issues are "transferred to the river system and downstream neighbors" (OCP 2009, 4). The issue has prompted a mandate from the Environmental Protection Agency (EPA) for Kansas City to "minimize overflows from combined and separate sewer systems," (OCP 2009, 4). The city itself has stated that "it is obvious that Kansas City's regard for and management of water has deteriorated" (ibid, 4).

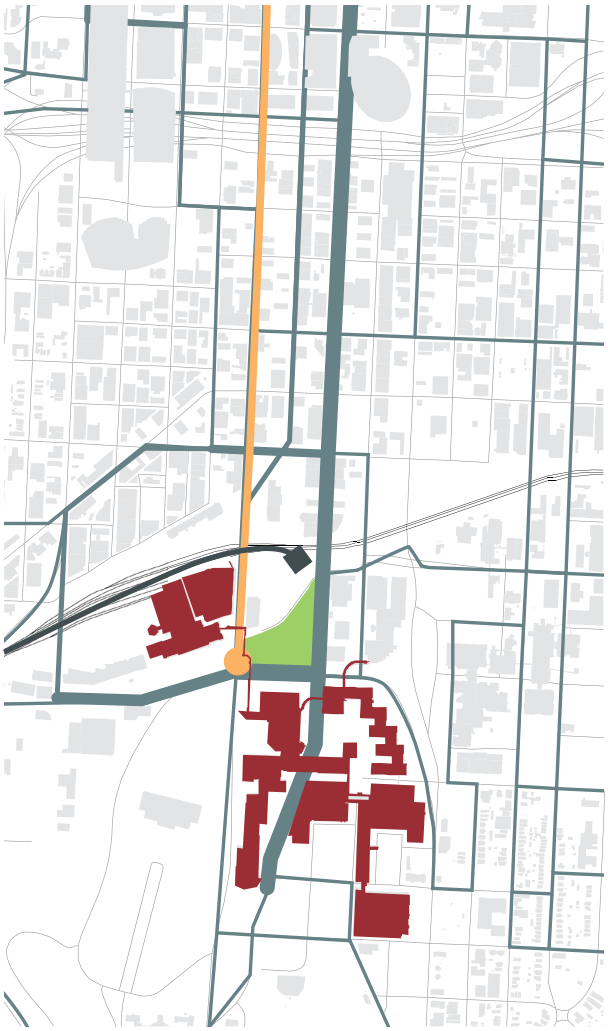


FIGURE 2.24: Washington Square Park Connections to City Plans (Modified by Author from KCDC 2013)

2.3.2 Kansas City's Overflow Control Plan

City of Kansas City, Missouri (OCP). 2009. "Overflow Control Plan Overview." Wet Weather Solutions Program.

The Environmental Protection Agency (EPA) issued Kansas City a mandate in 2003, requiring that the city implement sewer overflow control. In 2010, as part of a Clean Water Act Settlement, Kansas City consented with the EPA to reduce discharges from Combined System Overflows (CSOs) (OCP 2009). The City of Kansas City, the Wet Weather Water Solutions Program, Mid American Regional Council (MARC), and many other organizations have prepared an Overflow Control Plan Overview (OCP) to address the issues of storm water management in Kansas City, and the task of fixing it (OCP 2009). The OCP's goal is to use sustainable techniques and community input to guide the rehabilitation of their stormwater management system, which now relies heavily on a separate and combined sewer system. "There is a desire to utilize above ground, green infrastructure in a manner which provides substantial ancillary benefits to Kansas Citians beyond sewer overflow control, such as cleaner air, cooler ambient air temperatures, recreational and aesthetic amenities, and economic opportunities" (OCP 2009, 12). Within the OCP, the planning and design of future water solutions will focus on environmental, economical, and social affordances of all site implementations.

The design goals and objectives described by the OCP supports that of this project, with systems thinking and integrated design as the approach to solving water issues in Kansas City. Systems thinking is an approach to problem solving that "examines systems in an integrated manner," understanding the part in relation to the whole (OCP 2009, 9). This project adopts a systems thinking approach, viewing Washington Square Park as part of a larger ecological and social system. The understanding of these systems and their relationships is covered in the methodology, aiding in the water management design of Washington Square Park. Integrated design is an approach to design that values human and natural processes as one interconnected system. This is a core idea of the proposal, designing and programming with sustainable stormwater management strategies in a way that combines human and natural processes, and revealing these interconnections to visitors.

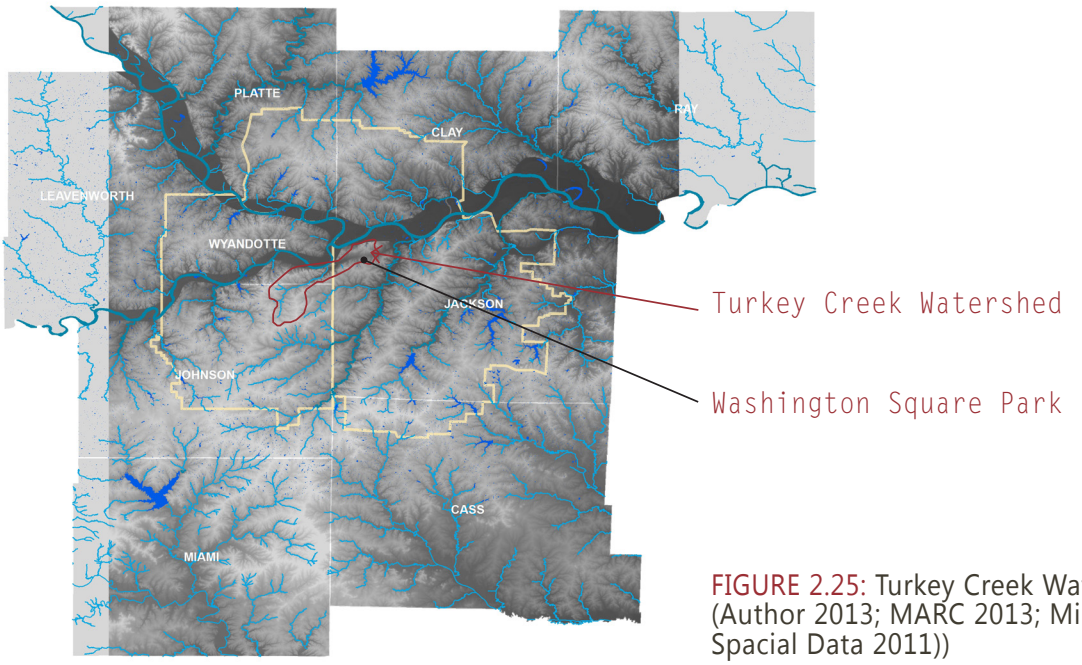


FIGURE 2.25: Turkey Creek Watershed (Author 2013; MARC 2013; Missouri Spacial Data 2011))

2.3.3 Turkey Creek Overflow Control Plan

(Black & Veatch, 2008. Overflow Control Program: Missouri River NEID/Turkey Creek Project Area - Preliminary Improvement Scenarios; Technical Memorandum)

Efforts to address the EPA mandate through the Overflow Control Plan Overview and its supporting documents have already begun. However, upon reading the actual Overflow Control implementation plans, there are few plans that embody the goals and objectives stated in the overview. Within these plans, is a small percentage of green infrastructure, or what the city calls stormwater best management practices (BMPs). "Stormwater BMPs infiltrate, filter, store, and evaporate stormwater runoff close to its source, preventing stormwater runoff from reaching the sewer system" (Ptomey 2013), with zero BMP plans in place for the Turkey Creek Basin (Appendix C). The Turkey Creek basin is one of the primary watersheds draining into the downtown area of Kansas City, Missouri (Figure 2.25). This area contains the most combined sewer systems, and experiences the most sewer overflows annually. Addressing stormwater management in the Turkey Creek basin should be a top priority in reducing sewer overflow volumes for this reason, and is the focus of this study.

Black & Veatch, an engineering, consulting and construction company, was hired by the city to develop stormwater management alternatives for Turkey Creek Basin. These alternatives were to reduce sewer overflows within the basin (Ptomey 2013). The engineered solutions for the Turkey Creek Basin will reduce overflow volumes by 85% at a cost of approximately $244 million, when implemented (Black & Veatch 2008)(Appendix A). The city and Black & Veatch have chosen engineered sewer system improvements to accomplish this goal. While BMPs were considered, they were eventually eliminated from the Overflow Control Plan and replaced with conventional sewer system technologies due to performance concerns (Black & Veatch 2008).

Black & Veatch identified control technologies that had the ability to store, convey, and treat the large CSO volumes, as well as provide multiple benefits. Of these, many sustainable stormwater management practices were eliminated because their "impact may be small and cannot be precisely estimated or controlled" and "therefore would have little or no measurable benefit for CSO reduction or elimination" (Back & Veatch 2008; 65) (Ptomey, 2013). Black & Veatch did state that BMPs placed on private property such as schools, institutions, and corporations, would benefit the Overflow Control Plan for Turkey Creek Basin. It was recommended that both the City and community (Ptomey, 2013) further pursue green solutions.

Black Veatch's current proposal for Turkey Creek Basin focuses on installing a 26 foot diameter tunnel system (Ptomey, 3013). This tunnel would start with a drop shaft installed just north of Washington Square Park. The main tunnel would transverse east-northeast through the center of the Turkey Creek basin following the Kansas Terminal Railway Company right-of-way.

Green Infrastructure: spatially and functionally integrated systems and networks of landscapes supported with artificial and hybrid infrastructures of built landscapes that provide multiple, complementary ecosystem and landscape functions to a public, in support of sustainability (Ahern, 2007)

2.3.4 A Paradigm Shift in Downtown KC

While waste can be an issue, it can also be an opportunity. There is opportunity in Kansas City to use stormwater management as a catalyst for future sustainable development. Kansas City possesses the need for a shift, the timing is right, and they have the desire. The city has many reasons why it needs a paradigm shift in the way they treat and think about water. Old stormwater management practices have led to flooding, contamination, and many public dollars in maintenance. There are also many reasons why the city is ready to make this shift. Due to the EPA mandate, Kansas City must make large expensive changes to their water infrastructure. These changes should be towards a more sustainable system. Kansas City has shown interest in a shift to more sustainable solutions, and has begun implementing them.

Green Infrastructure Projects in KC

As previously discussed, the Overflow Control Plan Overview demonstrates Kansas City's desire and acknowledgement of green infrastructure's potential as a game changing stormwater management strategy for the city. Through the guidance of the OCP Overview, one green infrastructure project has been completed, the Marlborough Neighborhood Pilot Project. The city's original plan for this area in 2008 was to install two underground tanks to store and transfer millions of gallons of water, the final plan replaced the tanks with gray and green infrastructure techniques to store and treat the water. The project broke ground in 2011 and will couple its design efforts with performance evaluations, socio economic benefit analysis, and efficacy of construction and maintenance techniques and costs. "The Marlbourough project represents the largest focussed installation of green infrastructure as a sole control for CSOs in the nation. As such, its success or failure could have a large impact on other green infrastructure projects throughout the country" (NRDC 2012). So far, the Water Services Department estimates that implementing these green infrastructure techniques will potentially save the city ten million in capital costs.

This project can provide the technical experience for a large public project in downtown Kansas City. While these projects have started the conversation about sustainable stormwater management, they are located in relatively low-density areas, with few people experiencing them except the citizens who live in the neighborhood. Another KC initiative that promotes stewardship at a different level is 10,000 Rain Gardens. This initiative was started in Kansas City in 2005 to "encourage residents to voluntarily install rain gardens on their property as a means of reducing stormwater runoff" (NRDC 2012, 1). The program provides educational resources for citizens and has developed multiple demonstration projects to promote the initiative. 10,000 Rain Gardens is an excellent example of how marketing strategies can motivate a community to think and live more sustainably (NRDC 2012).

It is clear that Kansas City is moving towards a sustainable future. However, Kansas City is missing opportunities to expedite their progress. The city has done an excellent job at supporting green projects and educational initiatives. However, "the city has yet to fully integrate green infrastructure into its long term planning overall" (NRDC 2012). There are no public spaces in the downtown area that serves as a cornerstone for sustainable water management in Kansas City. Furthermore, while marketing strategies have been employed to promote the acceptance of green infrastructure support, the projects themselves provide few focused efforts past signage to elicit care in citizens.

A demonstration project at Washington Square Park would reach out to many people, as well as serve as an example of how urban settings can integrate green solutions. In designing the project as a marketing tool in itself, Washington Square Park can become an icon for the future of sustainable development in Kansas City. In addition, Washington Square is an excellent opportunity for the city to lead by example.

Community Goals and Objectives for Washington Square Park and Kansas City

This project draws upon the current plans and proposals developed by Kansas City that are relevant to the Washington Square Park site. The most relevant document is the Request for Qualifications/ Proposals (RFQ/P) for Washington Square Park. The RFQ/P states that the project should "build on existing physical assets, previous plans and proposals for the area, and past exercises in community engagement" (City of Kansas City 2013, 4). To accomplish this objective, a city documents were recommended for review by the RFQ/P. This project will draw from the Greater Downtown Area Plan (GDAP), the Making Grand Street Grand document, and literature produced by the Kansas City Design Center as it relates to the Washington Square Park project. The goals and objectives extracted from these documents provide initial insight into what the city and stakeholders desire for the future of Kansas City, and for the Washington Square Park site. These goals guide the direction and scope of the project, and will influence the final design.

The improvements made to Washington Square Park are to support the goals within these documents; however, the stormwater management design that I develop for Washington Square Park is not intended to serve as a comprehensive development plan for the site. For this reason, my project does not encompass all goals stated. Furthermore, the goals stated in this paper represent relevant and attainable goals for Washington Square Park and stormwater management design within the scope of landscape architecture. They are not the composite goals of the plans and proposals.

Many of the goals and objectives from the plans and proposals are automatically achieved through the nature and stated intent of this proposal. Those goals and objectives are highlighted in white. By highlighting these, I can better identify what goals are being accomplished through the project proposal, and what goals still need to be addressed through the redevelopment of Washington Square Park. Drawing from community goals is a prerequisite stated by the Washington Square Park RFQ/P and is a necessary step towards motivating the community to adopt the water paradigm.

FIGURE 2.26: Looking North from
Washington Square Park (Loring 2014)

Washington Square Park RFQ/P

(City of Kansas City, Missouri, 2013. Washington Square Park Request for Qualifications/Proposals)

The Washington Square Park RFQ/P prepared by Kansas City's Parks & Recreation Department, defines the services required of the hired consultant (COEN), and the role of the stakeholders involved in the development process, including our masters group H.E.R.D.

Among the basic requirements in the request, was "Sustainability." This section, placed among the most fundamental conditions for the execution of the project. Supporting goals and objectives are listed in Figure 2.27.

- Design the site as a gathering and civic hub
- Welcome to all ages
- Reinforce the parks relationship to Kansas City's boulevard system
- Minimize waste, enhance efficiencies, and achieve multiple benefits and project synergies

FIGURE 2.27: Washington Square Park RFQ/P Goals (City of Kansas City 2013)

Greater Downtown Area Plan - KC

City of Kansas City, Missouri, 2011. "Greater Downtown Area Plan"

The Greater Downtown Area Plan (GDAP) is a development guide produced by the city and its stakeholders. This is the main guide for development and redevelopment projects in downtown Kansas City. The document contains goals, objectives, and recommendations to guide future development projects.

Washington Square Park was identified as a Catalyst Project in the Greater Downtown Area Plan (GDAP). Catalyst projects are identified by their "potential to trigger redevelopment in the surrounding area" (GDAP). The primary goals stated in the GDAP for downtown Kansas City are creating a walkable downtown, promoting sustainability, retaining and promoting safe, authentic neighborhoods, doubling the population of downtown, and increasing employment. While these broad overarching goals are not be fully achieved through the proposed stormwater management design, it does have the potential of addressing more site specific goals stated in the document. These goals and objectives are listed in Figure 2.28)

FIGURE 2.28: GDAP Goals (City of Kansas City 2011)

- Walkable downtown
- Promote Sustainability
- Retain and promote safety
- Increase employment
- Establish a system of district gateways (Washington Square Park is identified as a major gateway into downtown)
- Use public realm as a marketing and development tool
- Continue to reinforce Kansas City as an emerging leader in green infrastructure
- Implement green stormwater management strategies
- Implement green solutions in infrastructure and public realm improvements
- Create provisions to allow urban agriculture
- Emphasize stormwater management approaches which enhance environmental stewardship
- Encourage the installation of productive rainwater runoff mitigation strategies
- Activate the public realm by attracting people and increasing amenities
- Program existing parks with diverse activities
- Encourage low maintenance landscapes
- Public art should be incorporated into public infrastructure projects
- Explore opportunities to express local history and identity through art
- Use art to mark gateways
- Implement sustainable, green solutions and achieve multiple benefits
    - o Cleaner water
    - o Cleaner air
    - o Reduced temperature
    - o Impact on climate change
    - o Increased energy efficiency
    - o Aesthetic community benefit
- Develop with a long term financial view
- Address combined sewer system overflows
- Coordinate projects in order to maximize use of public funds
- Utilize public spaces to implement green solutions
- Promote stewardship of the city's resources
- Explore opportunities for public realm improvement in conjuncture with major new stormwater infrastructure investments
- Art influences should be encouraged

Grand Boulevard Streetscape Plan

(City of Kansas City, Missouri, 2013. Washington Square Park Request for Qualifications/Proposals)

This plan is the adopted vision for Grand Boulevard, the street directly adjacent to Washington Square Park (Figure 2.29). While the document presented many goals for the plan, listed below are those relevant to Washington Square Park. Emitted goals, for example, regard transportation, parking, and other circulation topics (Figure 2.30).

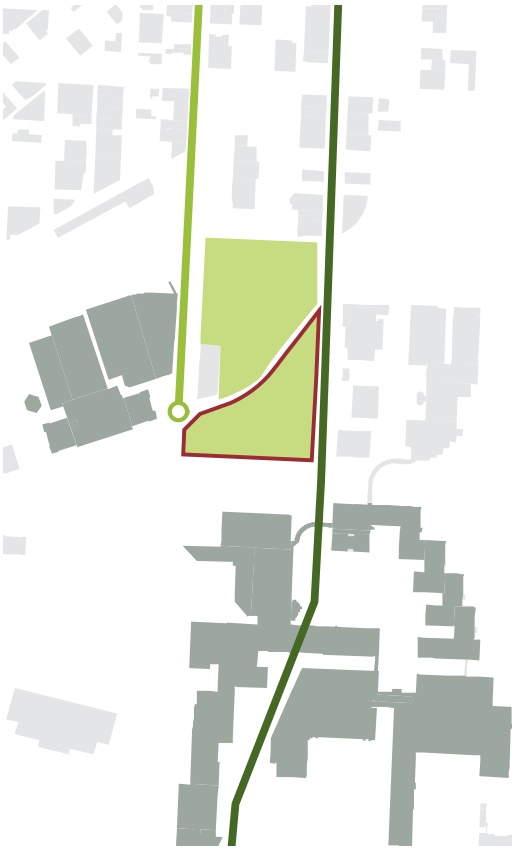


FIGURE 2.29: Location of City Plans (Adapted from KCDC 2012)

- More landscaping and sustainable stormwater systems
- Enhanced amenities
- Public art, fountains and spaces that are welcoming and scaled to pedestrians
- Program the street and public realm to function but be the "Signature Address"
- Keep existing character of Kansas City

FIGURE 2.30: Grand Boulevard Goals "Grand Boulevard Streetscape Plan" 2013)

Kansas City Design Center Proposals

Kansas City Design Center Urban Studio 2012. 2012. "Reconnecting: Comprehensive Vision Plan for Green + Civil Spaces in Greater Downtown Kansas City."

KCDC has does extensive mapping and research involving the Washington Square Park site and the surrounding area. In their comprehensive vision plan, KCDC identifies Washington Square Park as an anchor park. An anchor park is an iconic park which has permanence and embodies the identity of Kansas City (KCDC 2012). Their design proposal was based on site analysis research, and embodies the goals of the GDAP and RFQ (Figure 2.31). The work completed by KCDC will inform design decisions for the stormwater management project at Washington Square Park.

Because the goals of this proposal align with the goals of my project, its physical boundaries and suggested programming will be considered within my project development.

- Flexible multi-purpose space
- Multi-beneficial
- Act as an infrastructural element
- Adaptively reuse wasted landscape
- Take advantage of City views
- Provide functional amenities
- Connect to transportation stops
- Create pedestrian linkage to Union Station
- Provide additional retail development

FIGURE 2.31: KCDC Washington Square Park Goals (KCDC 2012)

Social

- WSP to be a gathering and civic hub welcome to all ages
- Reinforce WSP's relationship to the Boulevard system
- Create a walkable downtown
- **Retain and promote safety**
- Increase employment
- Use art to mark gateways
- Create provisions to allow urban agriculture
- Activate the public realm by attracting people and increasing amenities
- Program parks with diverse activities
- Incorporate art into public infrastructure projects
- Explore opportunities to express local history and identity though art
- **Cleaner water**
- Address CSOs
- **Cleaner air**
- Reduced temperature
- Aesthetic community benefit
- Adaptively reuse wasted landscape
- Take advantage of City Views
- Maintain KC vernacular

Ecological

- Minimize waste and enhance efficiencies
- Implement green stormwater management strategies, specifically in infrastructure and public realm improvements
- Encourage the installation of productive rainwater runoff mitigation strategies
- Address CSO's
- **Cleaner water**

Washington Square Park RFQ/P

Kansas City's Greater Downtown Area Plan (GDAP)

Kansas City Design Center (KCDC) Plan for Washington Square Park

Grand Boulevard Streetscape

From the City plans it is clear that Kansas City is striving for a holistic development approach. One that contains social, ecological, environmental, and even motivational goals. Figure 2.32 illustrates those goals that are relevant to fulfill the purpose of this project, and that fall within the scope of landscape architecture. These goals

Economic	Motivational
• Minimize waste and enhance efficiencies • Create provisions to allow urban agriculture • Increase employment • Encourage low maintenance landscapes • Increase energy efficiently • Develop with a long term financial view • Coordinate projects in order to maximize public funds • Adaptively reuse wasted landscape	• Use the public realm as a marketing and development tool • Reinforce Kansas City as an emerging leader in green infrastructure • Emphasize stormwater management approaches which enhance environmental stewardship • Promote stewardship of the city's resources

FIGURE 2.32: Synthesized Goals from Community Plans (Author 2014)

are drawn upon during the design process to be combined with the NUWM Framework to create Design Guidelines for Washington Square Park. Goals and objectives derived from current plans and proposals for Washington Square Park and Kansas City will ensure that the final stormwater management design of Washington Square Park fulfills the needs and desires of the community and stakeholders. It is the desire of the city and the stakeholders involved in the Washington Square Park project that the design considers previous plans and proposals. In addition, catering to the goals and values of the community is one of the first steps to motivating people to change their thoughts and actions (Manning 2013). For this reason, this section serves as both literature review for fulfilling the goals of the Washington Square Park project, and as a methodology in accomplishing the objectives identified in environmental psychology literature.

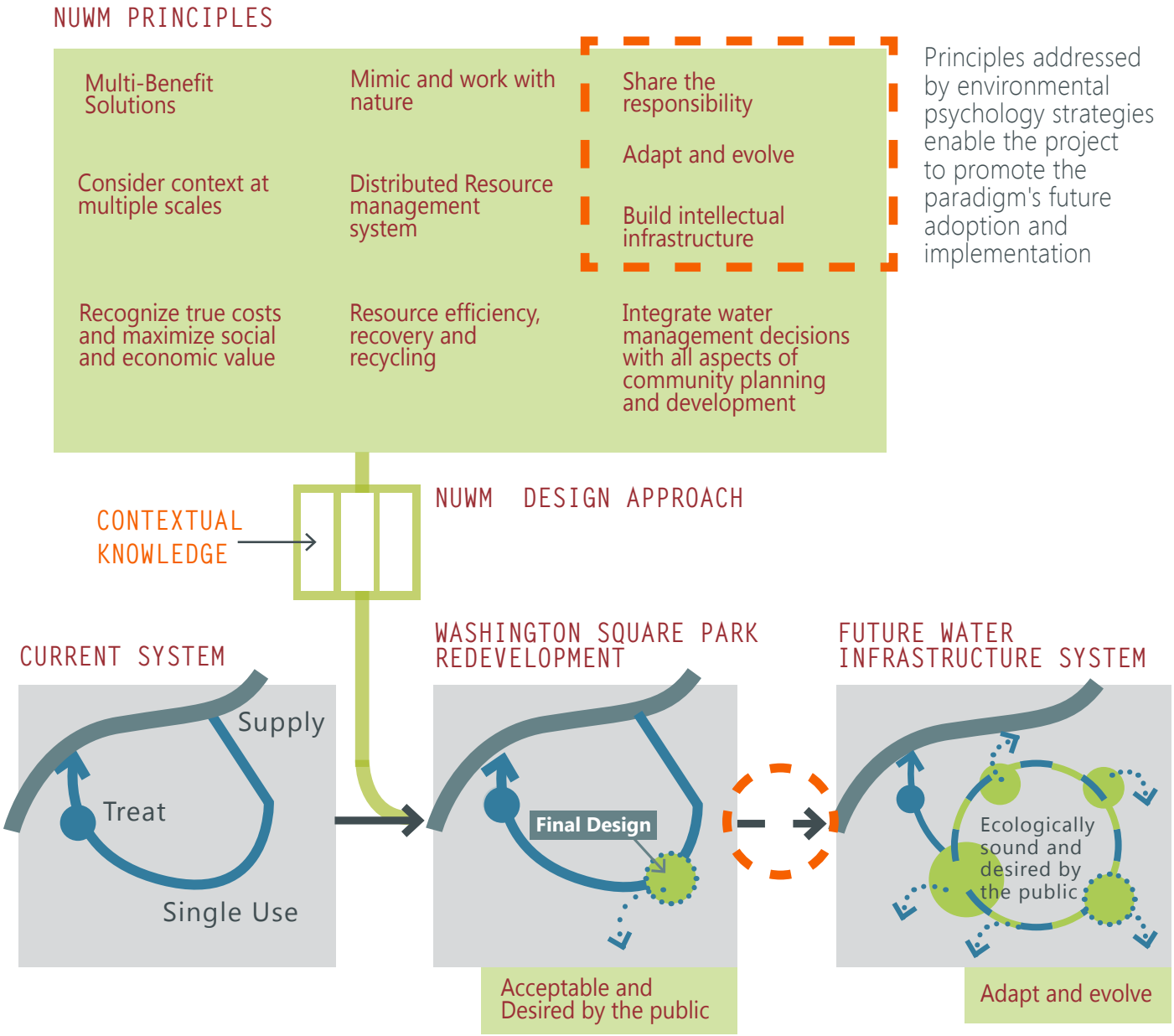


FIGURE 2.33: Role of Environmental Psychology in the Paradigm Shift (Author 2014)

2.3.5 Conclusion

Literature describing the anticipated nature of the future water paradigm, knowledge from environmental psychology, personal experience, and findings from case study analysis have been synthesized into ten key principles. These principles are the basis for what NUWM should embody as a development approach to water infrastructure within the scope of landscape architecture.

Figure 2.33 reflects back on the defined principles that comprise the NUWM paradigm within this project. A major finding from this chapter identifies the aptness of environmental psychology strategies for "filling" the gap in the proposed approach for future water-centric developments. Environmental psychology adds a motivational component to designs, making the development acceptable and desired by the public by providing for community goals and values.

During the design process in the Washington Square Park case study, the Contextual Knowledge Base part of this chapter will be revisited. The incorporation of the community and stakeholder goals identified within the Contextual Knowledge Base will be the key to guiding the motivational performance of the design. Designers must first know what motivates the community, what they care about and value, before they can attempt to frame the design through these values.

Chapter 3
FRAMEWORK

Section 3.1 Framework from Knowledge Base

This chapter combines the principles, objectives and strategies found in the Theoretical and Practical Knowledge Base Sections of the Background Chapter to present the New Urban Water Management Framework (Figure 3.1). At it's core, this water paradigm, or model of thinking and developing with water, should be "ecologically sound and accepted and desired by the public" (Ahern et. al. 2010, 20).

The purpose of the NUWM Framework is to organize and synthesize the principles and objectives for water-centric design in a way that embodies NUWM.

After using the principles and objectives in the ULI competition, I found that this Framework alone would not adequately guide a project to embody and promote the paradigm. The reason for this is because the principles and objectives are best effective when considered at different stages in the design process. For example, some should be considered during site analysis, while some are more effective when considered during Design Development or Reflection.

However, the Framework is a critical step in defining the NUWM paradigm, and translating the Background knowledge into a Design Approach (Figure 3.1).

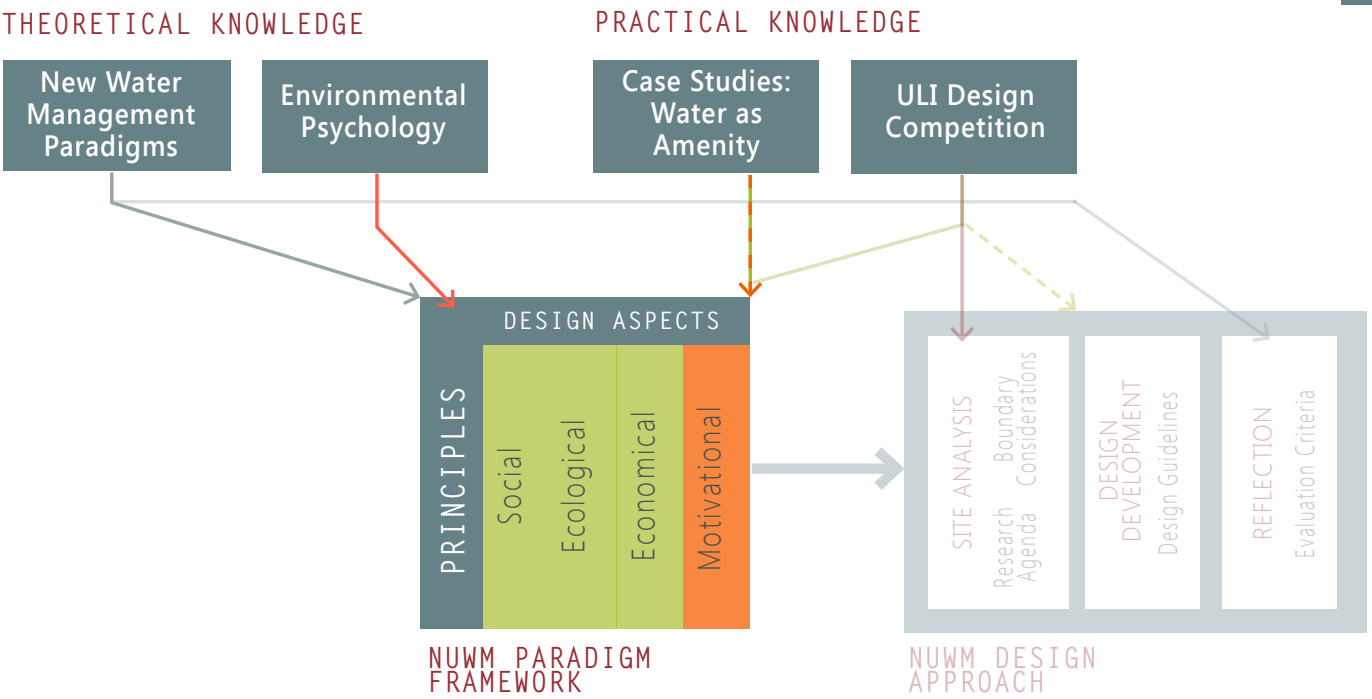


FIGURE 3.1: From Background to Framework (Author 2014)

Section 3.2 Framework Composition

The overarching Framework categorization allows the Framework to embody the NUWM principle of "multiple benefit solutions." These benefits are described by the water paradigm literature to be the traditional social, ecologic, and economic benefits. However, this project will refer to the categories as aspects, and append motivational aspects to this list. The social, ecologic, economic and motivational (SEEM) categories are not yet benefits, because what society considers beneficial is partially dependant on their world view and values, which the Framework does not know yet. For this reason the SEEM categories are considered "Aspects," because without contextual knowledge of the site and society, the design objectives and strategies have been placed based on my personal interpretation.

While social aspects are design implementations for the benefit of human well-being, these aspects are not always made apparent to visitors through the design. In fact, none of the categories ensure the adoption of the new paradigm into society besides providing multiple benefits that users don't always appreciate based on their personal values. Motivational aspects are separate because they should be considered as a separate criteria applied to all design strategies (Figure 3.2). In other words, all social, ecological, and economic design aspects must also possess motivational qualities. The motivational aspects optimize each strategy, adding personal relevance to them by framing them in a way that appeals to the community's goals and values.

To convince people to change their approach to water management, they must recognize how the new approach benefits their personal values. Illustrated in Figure 3.2, motivational design aspects are the final step in making this paradigm ecologically sound *and* desired by the public. It is the key link to the adaption

Aspect: a way in which a thing may be viewed or regarded; interpretation

and evolution of urban water management - the paradigm shift. The NUWM paradigm is not necessarily the final solution, but if used to change the mental models of society, it can continue to adopt and evolve to future needs.

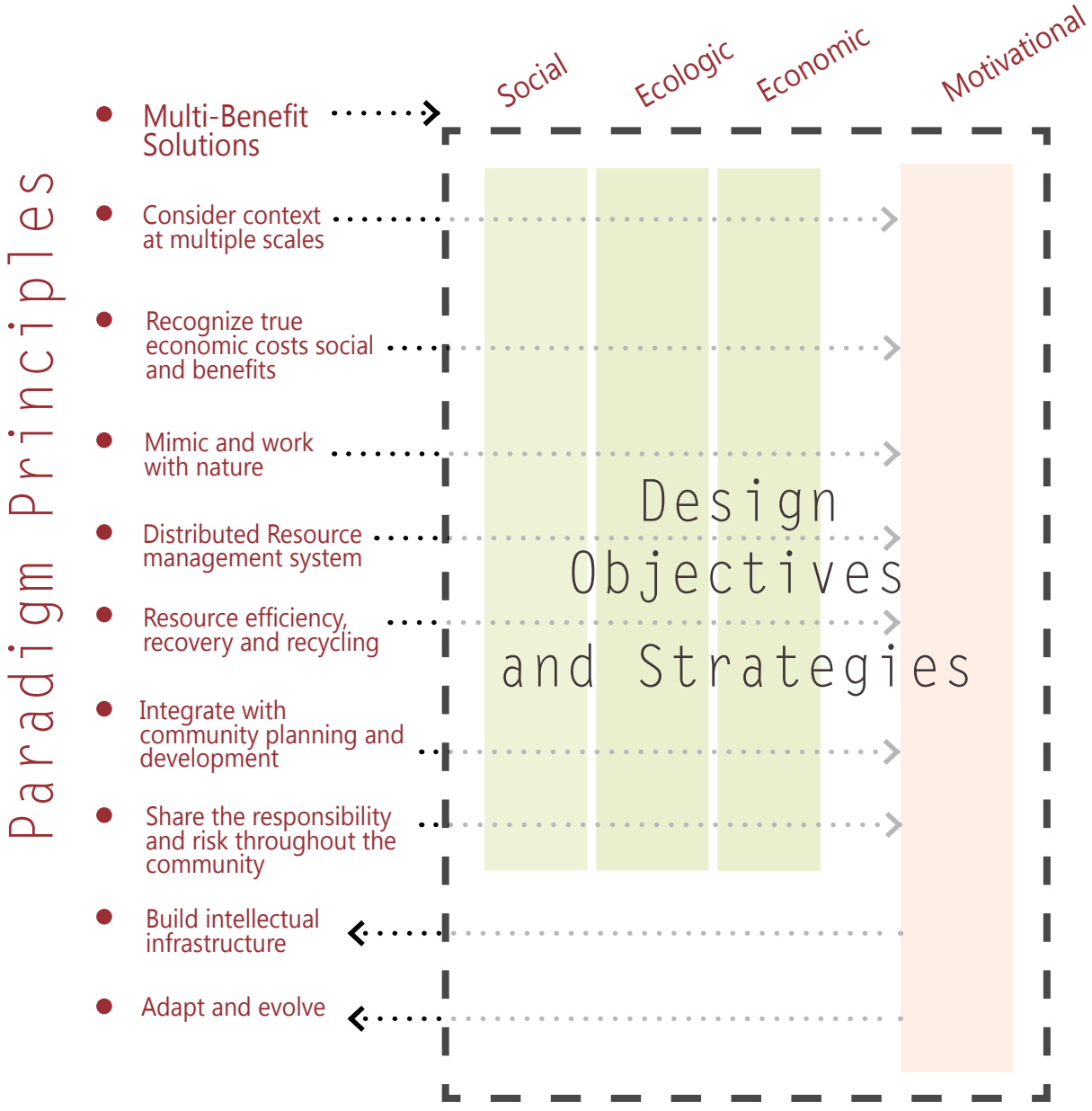


FIGURE 3.2: Framework Composition (Author 2014)

Motivational

- **Make sustainable behavior the social default**
  - Communicate normative information
    - Provide simple singage or exhibits with text and clear graphics
  - Provide opportunities for people to demonstrate sustainability
  - Create and nurture networks that spread sustainability
  - Breakdown bystander confusion
- **Emphasize personal relevance**
  - Support community goals
  - Define community values
  - Build upon community issues and efforts
- **Make hidden information visible**
  - Overcome perceptual barriers
    - Create a narrative of stormwater and the hydrologic cycle
    - Create symbols of past watershed conditions
    - Make stormwater-related artifacts integral to design
    - Create systems that visibly collect and store trash and pollution
    - Provide simple signage or exhibits with brief text and clear graphics
- **Create opportunities for competence, skills, and knowledge**
  - Give task specific information
  - Provide hands-on opportunities to try new behaviors
    - Design the stormwater treatment system to invite educational games or activities
  - Communicate effective action
- **Foster Mindfulness**
  - Create overlooks with views of the stormwater system
  - Create destination points related to stormwater treatment systems
  - Provide seating using walls, benches and /or tables and chairs with news of the stormwater system
  - Connect on-side trails systems and destinations that ensure encounters with the stormwater treatment system
  - Provide clear points of entry into the stormwater system that are visually inviting, mysterious and easily accessible
  - Make areas that incite climbing and physical exploration that balance perceptions of safety with adventure
  - Create systems that can be safely modified by the user such as small movable river rocks and weirs
  - Create treatment systems that are touchable
  - Engage thinking with something surprising
    - Make the stormwater treatment system playful, intriguing or puzzling
    - Create visual interest by varying the appearance of different parts of the stormwater treatment system

Adapt and evolve

3.2.1 Motivational Benefits

In order to promote a paradigm shift through a development project, the project must possess motivational aspects along with the traditional social, ecological, and economic aspects. It is not enough for the water treatment system to be ecologically sound, it must promote the adoption of NUWM in lifestyles and future decisions of the community in order to be sustainable.

Environmental psychology provides relevant principles to the Framework for guiding the integration of motivational aspects into designs (Figure 3.3). These environmental psychology principles are notated by the hollow red circles. Denoted by hollow black circles are environmental psychology objectives for fulfilling the larger principles, and denotated in white are strategies extracted from water as amenity case studies (Section 2.2.2).

These motivational aspects must be an overarching theme in the design, with each design strategy striving to embody and promote the new approach. For this reason, motivational aspects are separate from the traditional design aspects, as they are used as a tool by the other objectives and strategies to attribute personal relevance to social, ecological, and economic aspects of the design.

◄ FIGURE 3.3: Framework: Motivational Aspects (Author 2014)

3.3 New Urban Water Management Framework

The literature identifies the paradigm's principles and objectives and categorizes them based on their ecological, economic, social, and motivational benefits, as I have interpreted them (Figure 3.4). The objectives and their associated strategies are categorized to demonstrate the fundamental principle of the NUWM paradigm, which is to achieve multiple benefit solutions. It is also to help guide the translation of the Framework into a Design Approach that considers these benefits, and optimizes them based on the goals and values of the community.

While this framework is effective in communicating the underlying goals and objectives of the paradigm and illustrating its ability to provide multiple benefits, it alone is not effective as a design tool. This is because principles within the Framework need to be applied and considered at different steps of the design process. Until these aspects are separated and expanded, the Framework is a poor guide for designers. The Framework is expanded upon to include site specific information during the Design Approach Methodology.

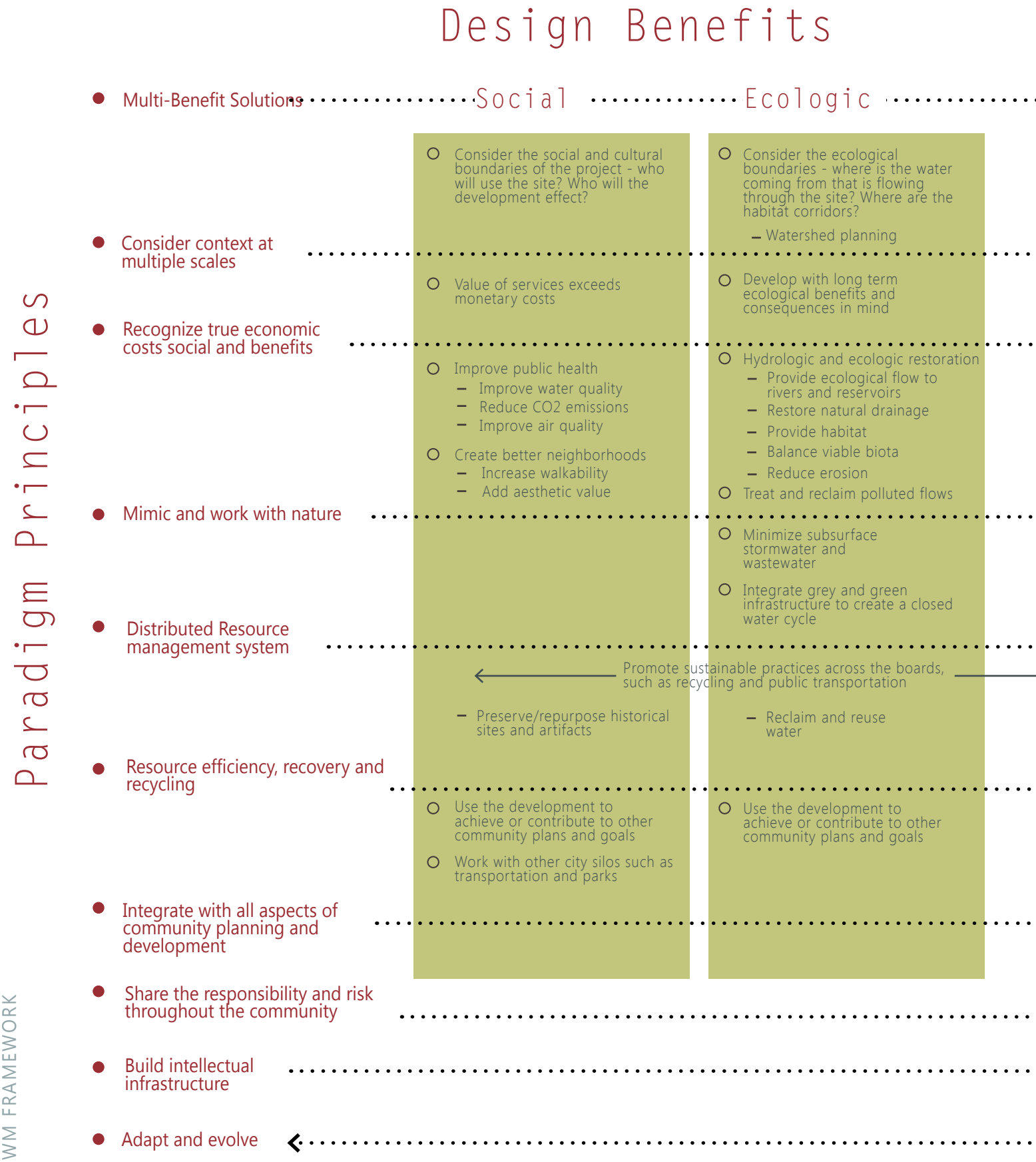


FIGURE 3.4: NUWM Paradigm Framework (Author 2014)

Economic

- Consider the political boundaries, who is paying for this development? Where can public/private partnerships be made?
- Develop with long term financial view
- Use phasing to optimize development value
- Increase natural resources
- Increase property values
- Increase resilience through multiple lines of defense again flooding and contaminates
- Reclaim and reuse water
- Close resource loops on-site
- Repurpose buildings and material
- Support goals of stakeholders
- Increases economic efficiencies through synergetic use of public funds

Motivational

- **Make sustainable behavior the social default**
  - Communicate normative information
    - Provide simple singage or exhibits with text and clear graphics
  - Provide opportunities for people to demonstrate sustainability
  - Create and nurture networks that spread sustainability
  - Breakdown bystander confusion
- **Emphasize personal relevance**
  - Support community goals
  - Define community values
  - Build upon community issues and efforts
- **Make hidden information visible**
  - Overcome perceptual barriers
    - Create a narrative of stormwater and the hydrologic cycle
    - Create symbols of past watershed conditions
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  - Create treatment systems that are touchable
- Engage thinking with something surprising
  - Make the stormwater treatment system playful, intriguing or puzzling
  - Create visual interest by varying the appearance of different parts of the stormwater treatment system

Chapter 4

DESIGN APPROACH METHODOLOGY

Section 4.1 Methodology Overview

The purpose of my research is to guide landscape architects towards a more integrated and holistic design approach for stormwater management projects. This new approach should motivate communities to think and act more sustainably in their water practices. This project studies how environmental psychology strategies can address this goal within the design process of stormwater management projects. The methodology addresses the question: How can stormwater management projects extend their social, ecological and economic affect, by motivating individuals and communities to adopt a new paradigm of thinking about and treating water?

This question is answered in three parts: a Knowledge Base, which aids in the creating of a the NUWM paradigm Framework for landscape architects (See Background Chapter 2); a Design Framework for landscape architects, which defines and organizes the principles and objectives in a way that embodies the NUWM paradigm (See Framework Chapter 3); a Design Framework, which provides guidance to designers on how to translate the Framework into their design process; and finally, a Case Study that applies the Framework and Design Approach to a redevelopment project at Washington Square Park in downtown Kansas City, Missouri (Figure 4.1).

These methods are used collectively to explore the application of the NUWM paradigm as a design approach for water-centric urban developments that are ecologically sound and desired by the public.

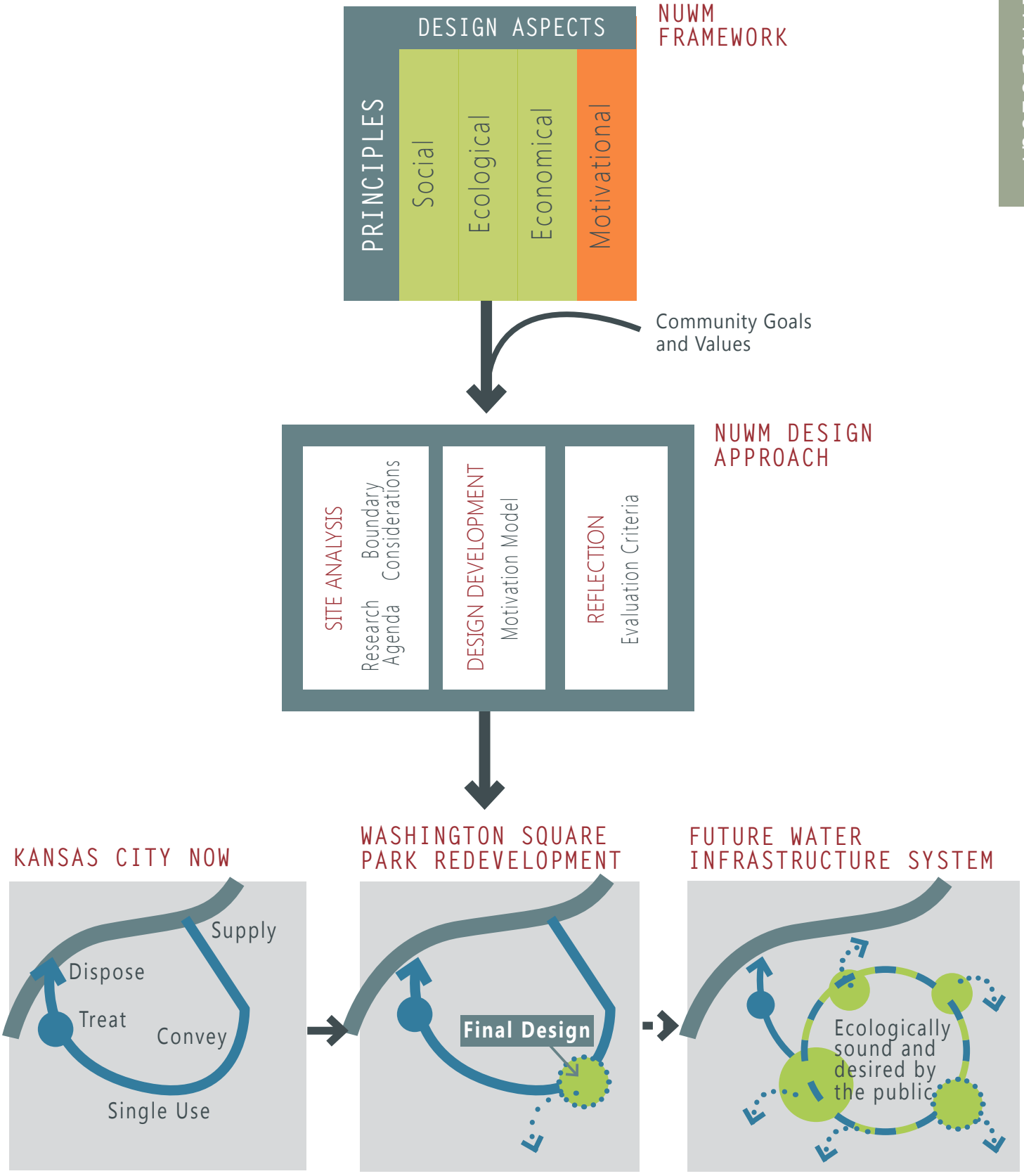


FIGURE 4.1: Methodology Process (Author 2014)

4.1.1 Design Approach Overview

As stated in the Framework Chapter, it is necessary to embed paradigm principles and objectives into the design process in order for a design to embody and promote the new paradigm. While the design Framework is not enough to accomplish this task, the Framework will inform each part of the Design Approach. The NUWM Framework provides the design with *what* needs to be accomplished, while the Design Approach guides designers in *how*.

Within the NUWM Framework, some principles and objectives are better served at different steps in the design process. This project breaks the Design Approach into three steps - 1. Site Analysis 2. Design Development and 3. Reflection. Within these three steps various design tools serve to connect contextual knowledge of the site with principles of the NUWM paradigm. These tools are Boundary Considerations, a Research Agenda, a Motivation Model, and Evaluation Criteria. It is through these tools that the general Framework translates into specific design strategies that are unique to the contexts of a site.

Design is an iterative process, so the steps are not meant to be executed in a purely linear fashion. However, the methodology provides tools to complete the initial site analysis, design development, and reflection as guided by the Framework, leaving the iterative process up to the designer.

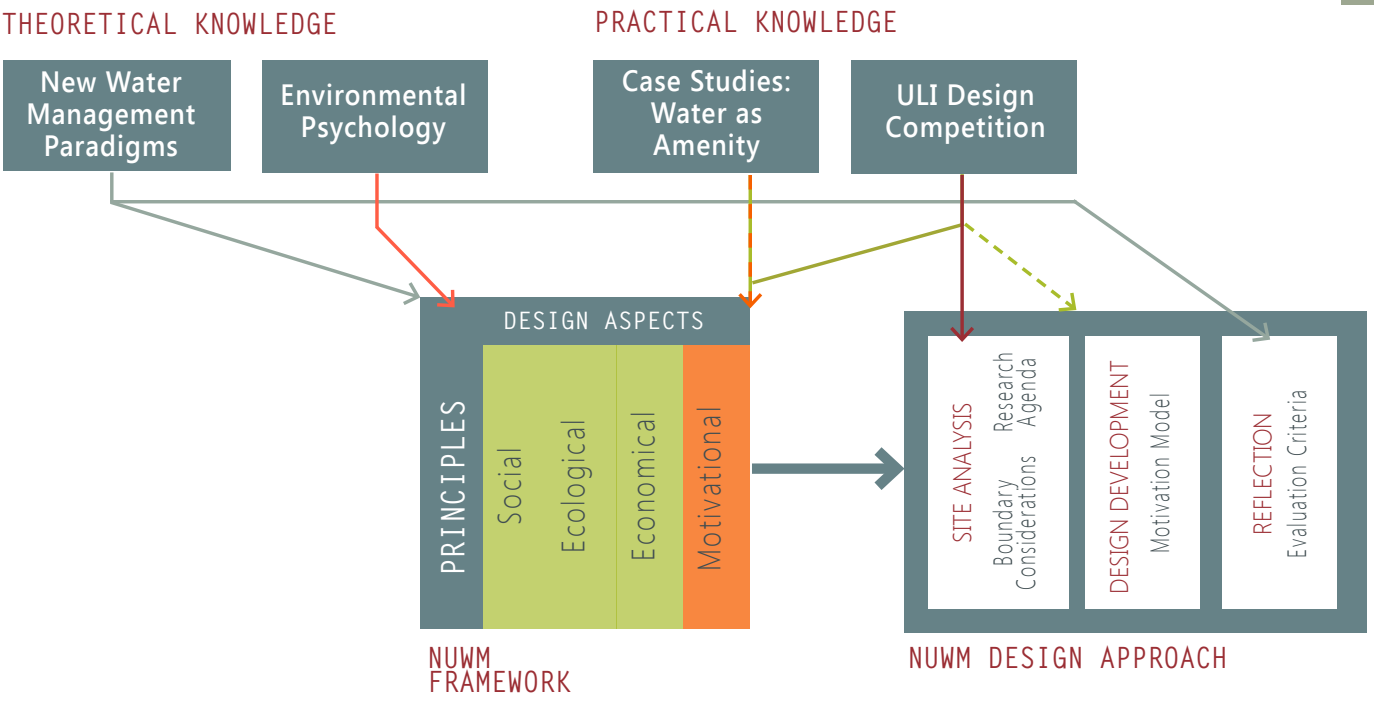


FIGURE 4.2: From Background to Design Approach (Author 2014)

Section 4.2 Site Analysis

Site Analysis is the first step in the NUWM Design Approach . Within this step, specific information is gathered about the site. This information is analyzed to inform decisions during the next step in the Design Approach, Design Development.

The NUWM Framework guides designers in identifying what information is necessary to inventory and analyze by asking "What information needs to be understood about the site to achieve this objective or strategy [listed within the Framework]?" The answers to that question are then categorized into the appropriate spacial boundary extend and subject, creating multiple Research Agendas to be executed at varying spacial scales.

Therefore, translating the NUWM Framework into the Site Analysis step requires two tools: Boundary Considerations and Research Agendas. These two tools work together to define a list of spacial investigations (Research Agenda) and determine what spacial extends should be used to execute the investigation within (Boundary Consideration). Based on previous experience in designing with the NUWM Framework, I know that the necessary boundaries to define and consider during Site Analysis are Water, Social, Development Potential, and Site Design. These tools work together in an iterative process to define the spacial extends of the boundaries and guide the execution of the Research Agendas.

4.2.1 Boundary Considerations

In response to the NUWM principle "Consider context at multiple scales," and informed by my experience in the ULI competition, there are four boundaries that need to be determined and considered during the site analysis step of the design process.

1. Water Consideration Boundary

2. Social Consideration Boundary

3. Development Consideration Boundary

4. Site Design Boundary

The extents of these boundaries are determined both by initial findings during Site Analysis, and can also be influenced by the scope and demands of the project. For example, the Site Design boundary will usually be determined by a client when using this methodology in practice.

1. Water Considerations Boundary

This boundary is determined by the watershed in which the site or potential development falls. Experts point to watershed management as the "rule of thumb" for designing water infrastructure systems at any scale. There are varying scales of watersheds depending on the point of discharge chosen to define it (Forest & Watershed Health).

The water being treated within a site almost never consists solely of the water that falls within the site boundaries. In addition, the path of the water that enters a site determines how fast it flows to the site and how contaminated it is. For these reasons, hydrologic design decisions need to be considered within the context of the entire watershed system.

Things to note within this boundary are flow accumulation, subsurface sewer extents, and elevation as they all play a factor in the hydrology of the site design.

2. Social Considerations Boundary

The purpose of the social boundary is to set a limit for social considerations affecting the design. This includes community goals, values, and plans. The development will affect the entire community, so it is important to determine this extent for site analysis.

There may be multiple boundaries of varying importance as they reach farther beyond the site. However, in order to achieve the principle of "Integrate with all aspects of community planning and development," the boundary must at least reach out to the extents of those plans. If collecting community values through surveys, the social boundary is determined by the extents of that survey.

Extents of social considerations are greatly dependant on the site scale, scope, and context. Boundaries from project to project will vary considerably.

3. Potential Development Boundary

Most project sites are not large enough to support a water infrastructure system that can make a significant social, ecological, economic, or motivational impact. In order to determine what areas beyond the site have the most impact potential, findings from the Social and Water Consideration boundaries must be considered (e.g. land ownership, proximity to flow accumulation, current social or commercial nodes, and connectivity to the site).

I found from my experience in the ULI competition that areas in close proximity to water accumulation and flow should be considered first, as these areas have the most potential impact on the water treatment system. Areas that already have a steady flow of people to it have the most potential for social and motivational design aspects, due to the sheer amount of people who are exposed to the water systems. Finally, the areas must be either physically connected to the site, or be part of a system of connected spaces in order to have a social and hydrological flow into the site.

4. Site Design Boundary

The site design boundary of the project will serve as the primary design extents, with the potential development boundary being secondary. The information gathered in the water, social, and potential development boundaries are all to be analyzed in reference to the site design boundary. The findings from each boundary during site analysis are considered during design development.

4.2.3 Research Agenda

The second part of the Site Analysis step in the design process is to develop a set of Research Agendas based on the objectives and strategies of the Design Framework for each boundary. In order to achieve the design objectives, certain information about the specific site and its contexts must first be discovered and analyzed. Questions need to be answered about the site to fulfill each objective or explore each design strategy.

For each objective ask "What site specific information do I need in order to fulfill or address this objective?" For example, in order to minimize subsurface drainage, one must first know where subsurface drains are occurring and identify suitable surface areas where drainage could be management instead.

Once a comprehensive Research Agenda is compiled, each point within the agenda will be categorized into the appropriate Boundary that it should be answered within.

The answers to these questions are either addressed by spacial maps executed within the appropriate boundary, or a detailed literature review.

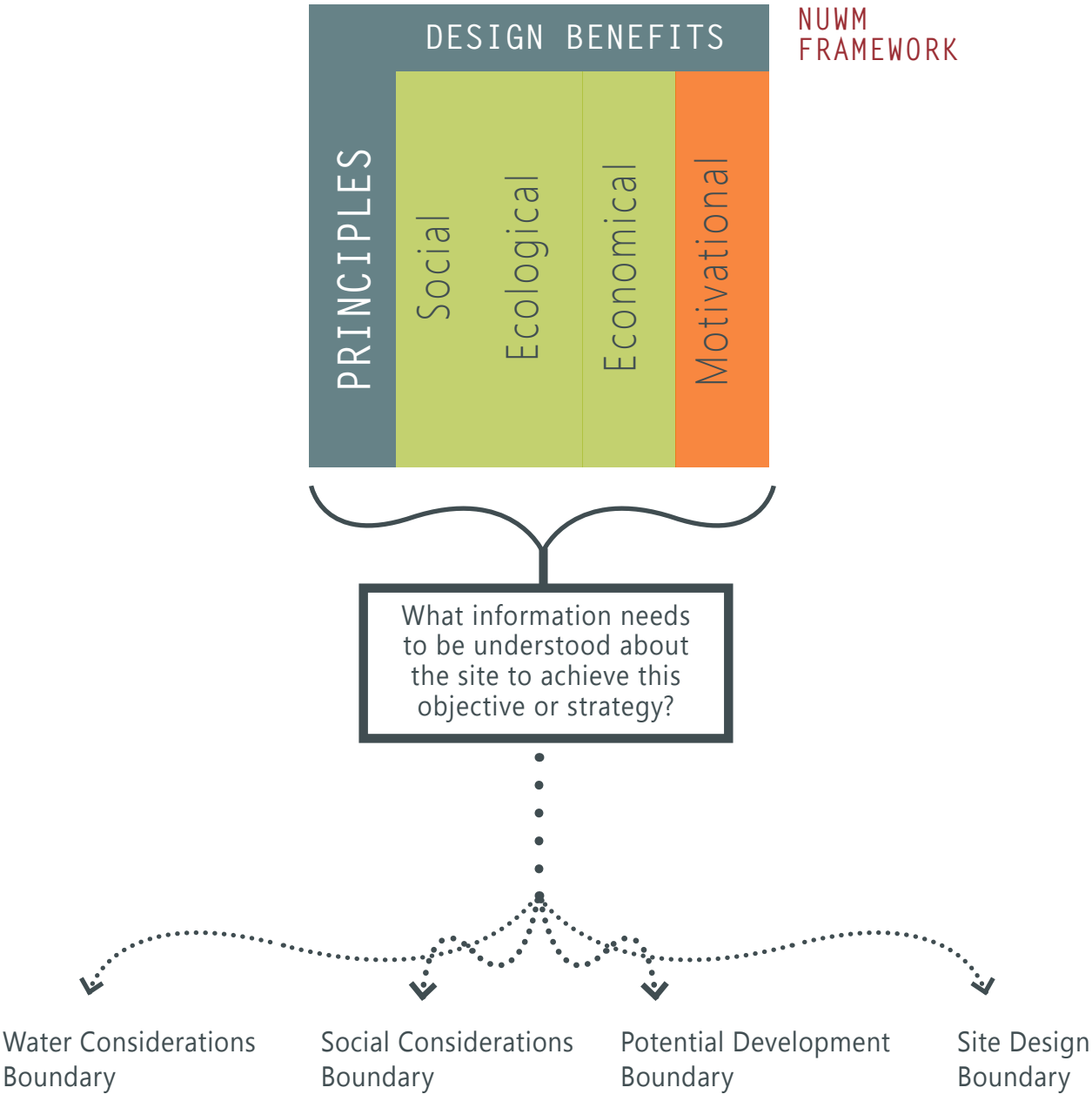


FIGURE 4.3: Methodology: Research Agenda (Author 2014)

Section 4.3 Design Development

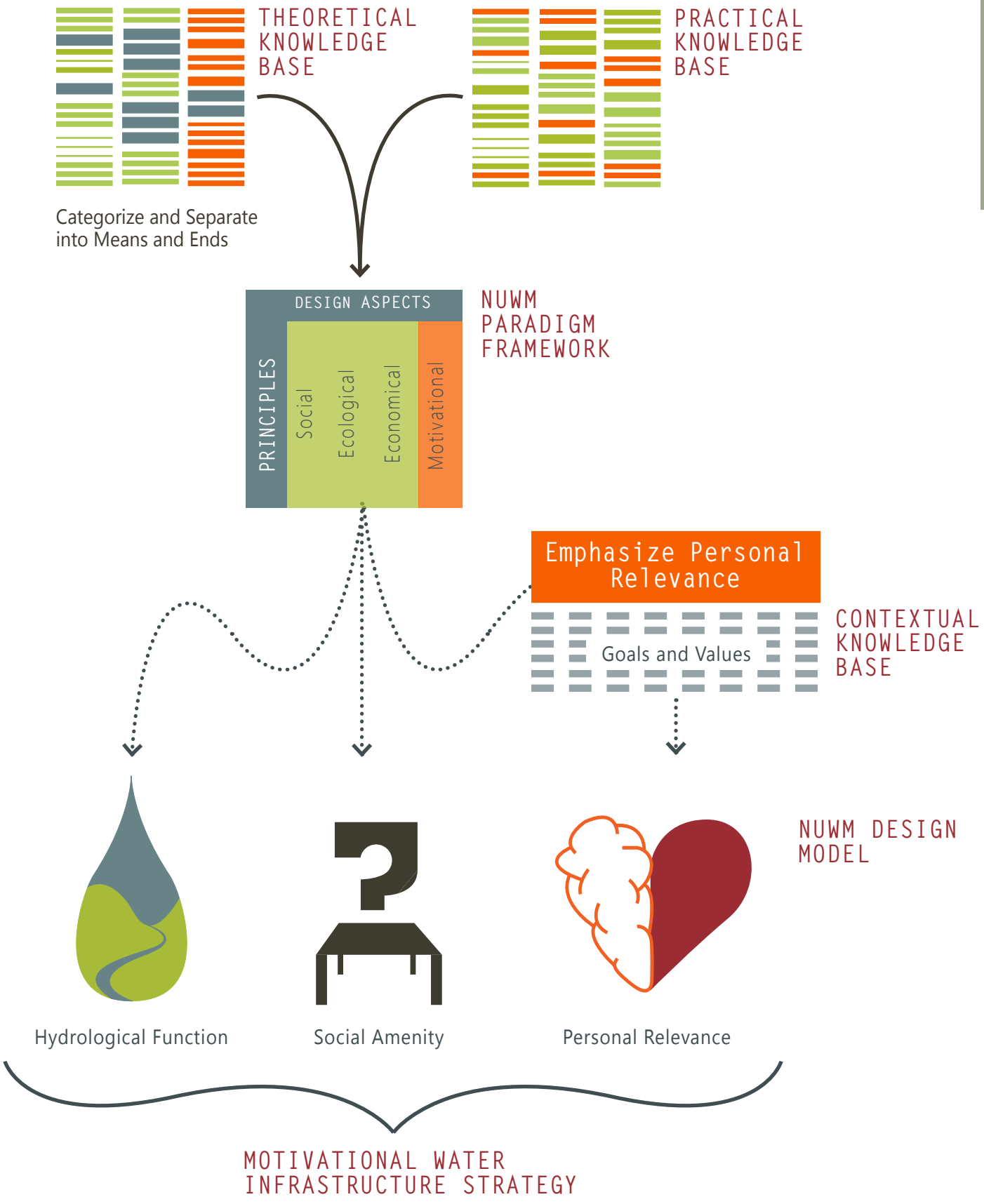
4.3.1 Linking Personal Relevance to Hydrologic Functions

After testing out different ways to interpret the paradigm Framework into a format that guides designers to create motivational water-centric development, a three part design model was developed as the most effective format. Three things need to be present in the design: an ecological function, a physical amenity, and personal relevance (Figure 4.4). The design strategies developed through this model are physical amenities that attribute social value to hydrological functions. The design strategies accomplish this by physically and visually exposing users to the function, then using interpretive environmental psychology strategies to create an experience that allows visitor to recognize how that function is relevant to their goals and values. Together, this design model aids designers in creating experiences that motivate users to adopt the NUWM approach, thinking about and treating water as a resource.

The Personal Relevance factors for each project will be different, taking into consideration findings from the detailed literature review regarding community goals, plans, and values.

City development plans, watershed plans, and overflow control plans (or other water infrastructure plans) should be reviewed and analyzed within the Site Analysis step to identify personal and community goals and values. However, not all information within the plans are relevant. Only goals and objectives within the scope of landscape architecture that pertain to general sustainable development and specific stormwater management strategies are considered.

FIGURE 4.4: Methodology: NUWM Motivational Design Model (Author 2014)


THEORETICAL KNOWLEDGE BASE
PRACTICAL KNOWLEDGE BASE
Categorize and Separate into Means and Ends
DESIGN ASPECTS
PRINCIPLES
Social
Ecological
Economical
Motivational
NUWM PARADIGM FRAMEWORK
Emphasize Personal Relevance
Goals and Values
CONTEXTUAL KNOWLEDGE BASE
NUWM DESIGN MODEL
Hydrological Function
Social Amenity
Personal Relevance
MOTIVATIONAL WATER INFRASTRUCTURE STRATEGY

I. HYDROLOGIC FUNCTION

Mimic and Work with Nature

- Provide ecological flow to rivers and reservoirs
- Restore natural drainage
- Provide habitat
- Balance viable biota
- Reduce erosion
- Minimize subsurface drainage
- Integrate grey and green infrastructure
- Reclaim and reuse water to create closed water resource cycles

II. SOCIAL AMENITY

Expose Functions

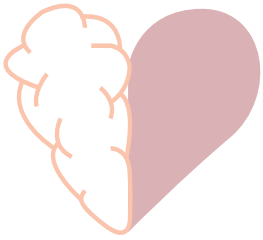
- Bring water to the surface
- Create systems that visibly collect and store water and pollution
- Create overlooks with views of the water system
- Place water systems in social hubs or make the water system a destination
- Provide paths to the water system that connects to existing trails
- Provide clear points of entry into the water system
- Provide seating with views of the water system
- Create water systems that are touchable

Foster Mindfulness

- Provide informational signage and exhibits
- Create a narrative of the water system
- Create symbols of past watershed conditions
- Make stormwater related artifacts integral to the design
- Engage thinking with something surprising

Create opportunities for competence, skills, and knowledge

- Provide opportunities for people to demonstrate sustainable water practices
- Nurture networks that spread and support sustainable water practices
- Communicate effective action
- Invite educational games or activities



III. PERSONAL RELEVANCE

Community Goals and Values

*Community specific

4.3.2 Three Part Model to Motivational Water Infrastructure Strategies

The three part model is derived from the NUWM Framework. Content from the Framework is separated into three variables: Hydrologic Function, Social Amenity, and Personal Relevance (Figure 4.5). These variables represent the steps in developing design strategies that are ecologically sound and desired by the public. In order for the design to embody the NUWM paradigm, at its fundamental core, it must be ecologically sound. Not only are the hydrologic functions of the design the fundamental purpose of the design, it is also crucial in being able to demonstrate the new approach to stormwater management to the community. The ecological functions must be considered first in the design development, because they have the most dependant variables associated with them. The location, function, and aesthetics of water infrastructure elements are highly dependant upon site context and conditions of slope, water accumulation, soils, aspect, and proximity to structures to name a few.

The second step to a motivational water infrastructure system is to make strategies a physical social amenity that is either visually or physically accessible to the public. Through exposure, people can observe the functions, learning about them experientially. This experiential learning can develop a deeper sense of care in visitors about the ecological functions (Bechtel & Churchman 2002).

FIGURE 4.5: Design Model for Motivational Water Infrastructure Strategies (Author 2014)

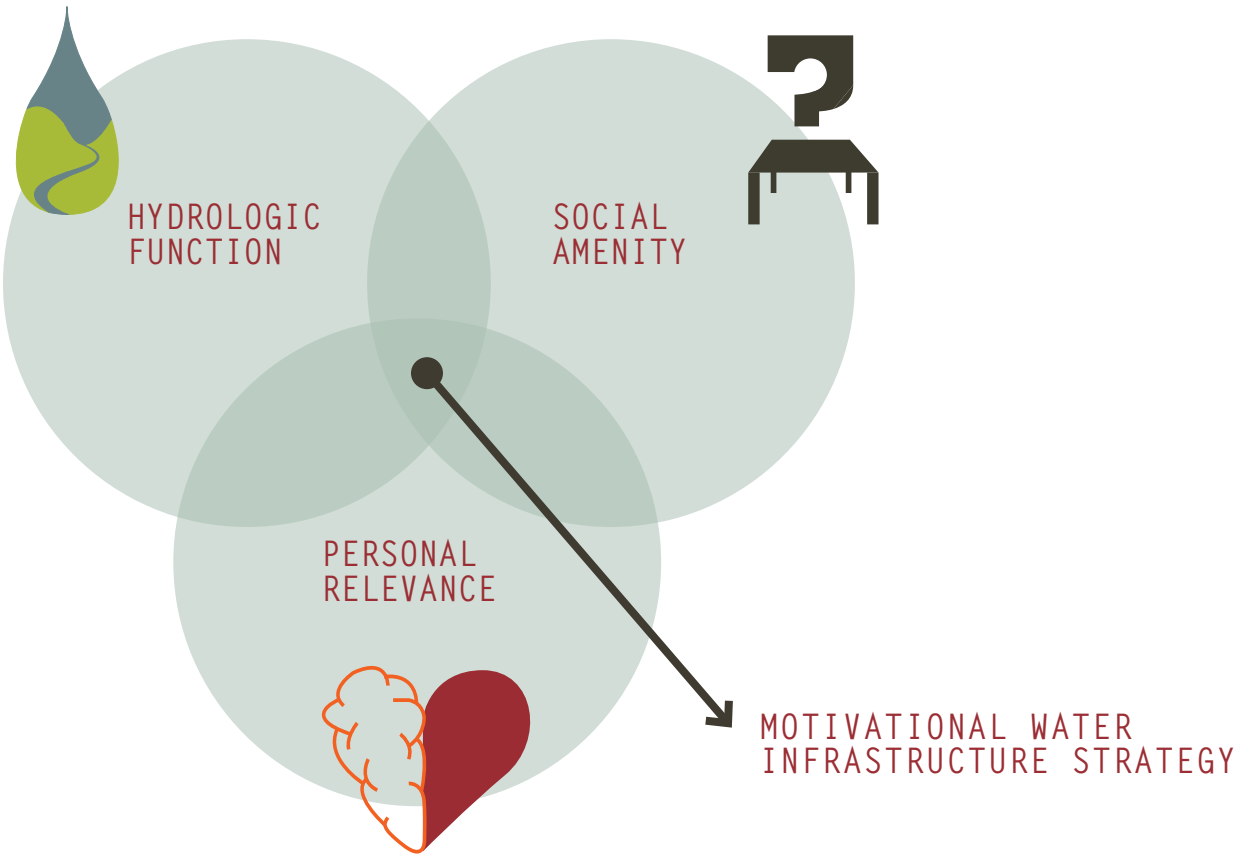


FIGURE 4.6: NUWM Motivation Design Model (Author 2014)

To aid in developing a deeper care in visitors about the ecological functions, the final step communicates how the amenity supports the social values of the community. This step is achieved through interpretive design strategies within the physical amenity. For example, the physical design strategy is a series of lookout points of art pieces placed in various green infrastructure elements. These art installations could visually communicate a narrative about how the ecological functions of the site are cleaning the water, air, and providing habitat. A less interpretive design strategy is informational signage that describes how exposure to nature is good for mental and physical health. Finally, some strategies are more experiential, such as achieving the community goal of a more walkable downtown by using box trees that provide shade, and vegetated bioswales as a buffer between roads and sidewalks. It is the hope that by using the development to achieve community goals, personal relevance will become associated with the hydrological functions that are used to fulfill them. Together, these three variables can be layered to create motivational water infrastructure strategies (Figure 4.6).

Section 4.4 Reflection Criteria

The reflection part of the design process is the time where the designer, stakeholders, and other involved parties look at the proposed design and ensure that it aligns with the initial goals of the project. For projects aspiring to design within the NUWM paradigm, these goals are the base principles of the paradigm. This reflection process analyzes the success of the design. In doing so, it is also analyzing the efficacy of the design Framework and Approach in guiding a design to embody and promote the NUWM paradigm. Reflection can take many forms - graphic or textual, so long as it answers the question "Does the design accomplish the paradigm principles through the proposed design Framework and Approach?" In this way the paradigm principles serve as the Reflection Criteria.

Reflection is not necessarily the last step. Multiple iterations through the design process of site analysis, design development, and reflection occurs as more information is revealed about the site's constraints and opportunities.

Chapter 5

CASE STUDY

WASHINGTON SQUARE PARK

KANSAS CITY, MISSOURI

Section 5.1 Case Study Purpose

This chapter describes the process for applying the Framework and Design Approach to a specific site—Washington Square Park in Kansas City, Missouri. While the Framework itself provides general goals for *what* the design should accomplish, and the Design Approach guides designers on *how*, neither are complete until site specific information (e.g. community goals and values) is added.

When dealing with ecological issues, context is key. There is never a one size fits all solution (McHarg 1994). Therefore, if designers want their designs to be safe, healthy, and resilient (things required within the NUWM paradigm), they must be tailored to the strengths, weaknesses, opportunities and constraints of the site. Washington Square Park will serve as a case study for how to do this within the NUWM paradigm, using the prescribed Framework and Design Approach.

The design process for Washington Square Park underwent multiple iterations of Site Analysis, Design Development, and Reflection. This chapter will review findings and present the final design solutions that resulted from the process. Section 5.5, "Reflection", will reflect upon the final design solutions and their efficacy in fulfilling the principles of the NUWM paradigm through and Design Approach, as well as the ability of the design to address community goals and values.

5.1.1 Case Study Goals

- Apply the NUWM Framework and Design Approach to Washington Square Park
- Design Washington Square Park as a catalyst for sustainable water practices and development in downtown Kansas City
- Explore and identify design strategies that attribute social values of the community to hydrological functions
- Provide COEN and the City of Kansas City with a viable design that embodies and promotes the NUWM paradigm
- Provide COEN and the City of Kansas City with a viable alternative to the current Black & Veatch drop shaft and pipe solution for the Turkey Creek Basin sewer system issues (Appendix C)

5.1.2 Design Process Overview

First, Research Agendas were created for the Social and Water Considerations boundaries from the NUWM Framework. The process used to extract these agendas from the NUWM Framework can be seen in Appendices D-F. The findings from these executed agendas (site analysis) then lead to the definition of the Potential Development Boundary. It was concluded based on water and social considerations that the Crown Center district just South of Washington Square Park has high development potential for increasing Washington Square Park's social, ecologic, economic, and motivational affects on the community. For this reason, design suggestions for the district are made during Design Development. The remaining site analysis was more or less constrained to the extents of this Potential Development Boundary, and findings were analyzed based on their relevance to the Site Design Boundary. The Site Design Boundary consists of the physical sight boundary of Washington Square Park, and the parking lot just North of Washington Square Park (Figure 5.1). This decision was made based on the findings from the water considerations boundary, identifying the North Parking lot area as having the highest potential for affecting the hydrological functions of the watershed.

Previously described reflection upon the NUWM framework and experience in the ULI Competition lead me to conclude that designing to embody and promote the NUWM paradigm requires using a three part model during design development. This model assumes that in order for a design strategy to embody and promote the NUWM paradigm, it must have a hydrological function, be an amenity, and communicate personal relevance to visitors. Basically, the design needs to connect people visually and physically to the water infrastructure element, then use environmental psychology strategies to emphasize how that function supports the goals, values and issues within the community.

The community values were taken from surveys conducted by the Mid America

Regional Council (MARC)(Appendix G). During the Design Development step, the specific goals and values of the community are used to fill in the Design Model's "Social Value" variable. Defining what is personally relevant to the community reveals what beneficial aspects should be emphasized and revealed through the design. The community goals for Washington Square Park were drawn from City Plans.

FIGURE 5.1: Site Boundary: Washington Square Park + North Parking Lot (Author 2014)

The Site Design Boundary is defined by the property boundary of Washington Square Park plus the surface parking lot just North of Washington Square Park. The site design takes into consideration all of the findings from the site analysis conducted at the three different scales of water, social, and development considerations. It is within the site boundary, and the later defined Potential Development Boundary, that specific design solutions will be executed.

FIGURE 5.2: Regional Water Context of Washington Square Park (Author 2014)

Washington Square Park's Relevance in Kansas City's Water Issues

- Located in one of the main watersheds that drains into downtown Kansas City
- Located in an area that contains combined sewer systems and CSOs
- Has a buried historical branch of the Turkey Creek running through it
- Located by Union Station, a significant civic center in Kansas City, and Crown Center, a significant commercial Center in Kansas City
- Just North of Washington Square Park is the site where extensive engineered water system improvements are to be installed (Appendix C)

Section 5.2 Site Context & Analysis

The general context of Washington Square Park within Kansas City is stated in Section 2.3. It is within this section that Washington Square Park's relevance within Kansas City's water issues is established. Figure 5.2 recaps the driving contextual forces that make Washington Square Park an appropriate site for a stormwater management project that begins to shift the way Kansas City approaches water resources in future developments.

This section presents the research agendas and site analysis findings for the Water, Social, and Potential Development Boundaries - starting with the water and social boundaries, as their findings inform the delineation of the Potential Development boundary.

Concluding each boundary's findings, basic design recommendations are stated, guiding the next step of the Design Approach, which is Design Development.

5.2.1 Watershed Considerations

Hydrological Functions at the Core of Design Development

The water boundary used for Washington Square Park is defined by the small watershed that the site is located within (Figure 5.4).

HISTORICAL HYDROLOGIC CONTEXT

This watershed historically fed into a branch of the Turkey Creek, which is now buried. However, the drainage pattern within the water shed still follows that historical creek bed.

EXISTING HYDROLOGIC CONDITIONS

The current flow accumulation along the historical Turkey Creek Branch, along with the potential to "day light" this historical ecological feature, affords the land it flows through (Crown Center District) cultural and ecological opportunities for redevelopment, and is considered in the definition of the Potential Development Boundary.

The Turkey Creek used to flow just North of the parking lot. Even though the Creek is now buried, the area still serves as the natural drainage path and existing flood zone (Figure 5.5).

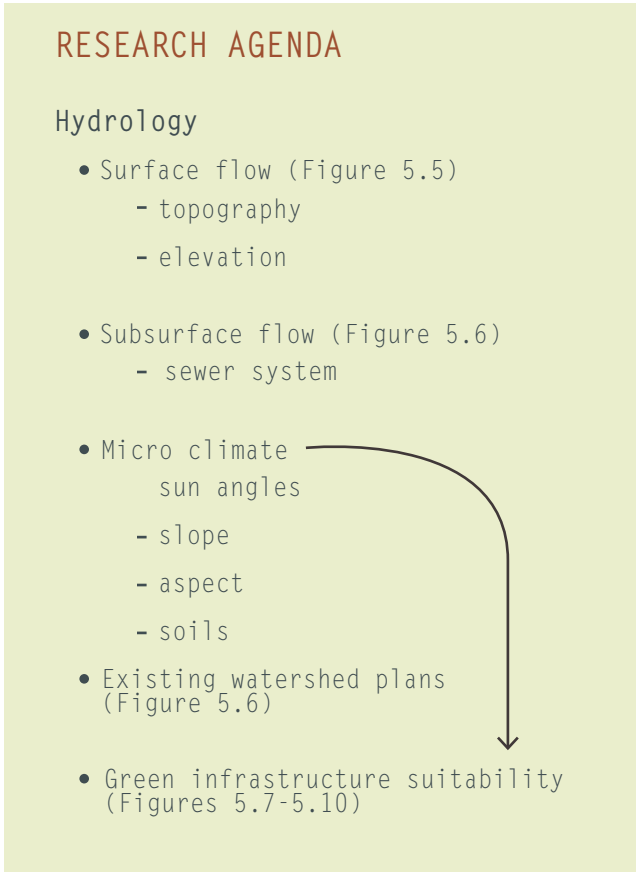


FIGURE 5.3: Research Agenda for Hydrologic Consideration Boundary (Author 2014)
This Research Agenda was developed using the methodology described in Section 2.3 of this book. The process of how I translated the paradigm Framework in a Research Agenda for Water Considerations can be view in Appendix E

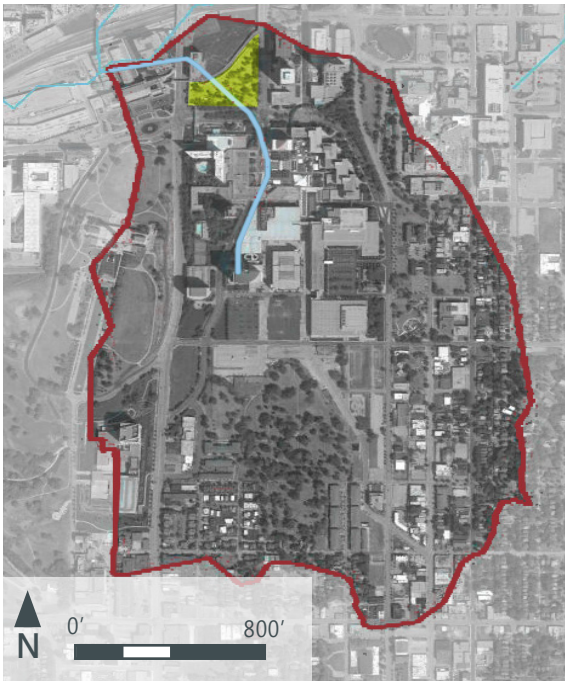
FIGURE 5.4: Water Considerations Boundary: Watershed (Author 2014)

FIGURE 5.5: Surface Flow (Author 2014)

FIGURE 5.6: Current and Planned Sub-Surface Water Infrastructure (Author 2014)

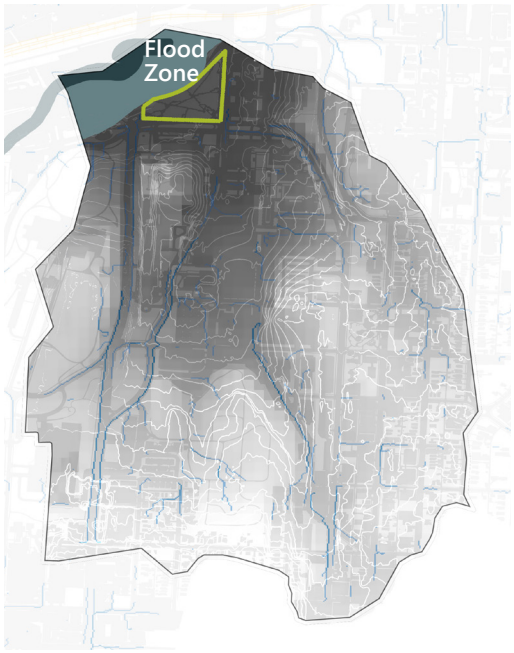
FUTURE HYDROLOGIC PLANS

Within the northern parking lot of Washington Square Park is the planned location for a drop shaft and pipe to be installed as part of Black & Veatch's proposed solution to the CSO issues in the Turkey Creek Basin (Appendix C). The fact that the physical manifestation of the plan is occurring on the site affords the site an opportunity to counter this plan with a more ecologically sound plan that provides multiple benefits, becoming a desired amenity for the public.



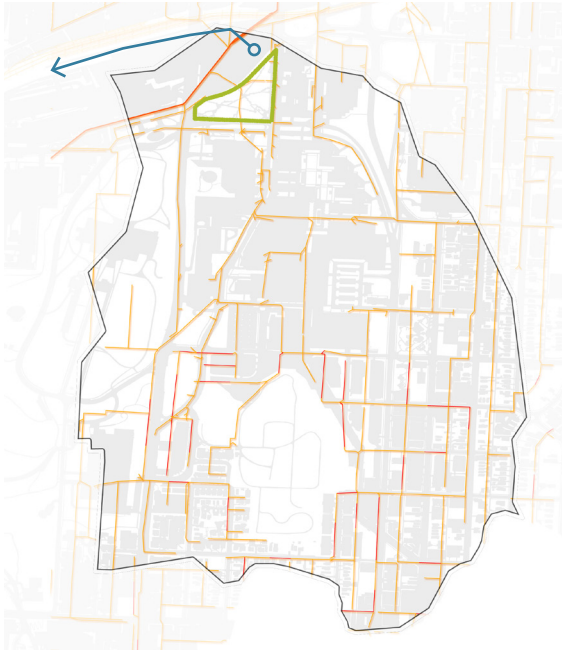
[5.4]

Historic Turkey Creek Branch
Watershed Boundary
Washington Square Park



[5.5]

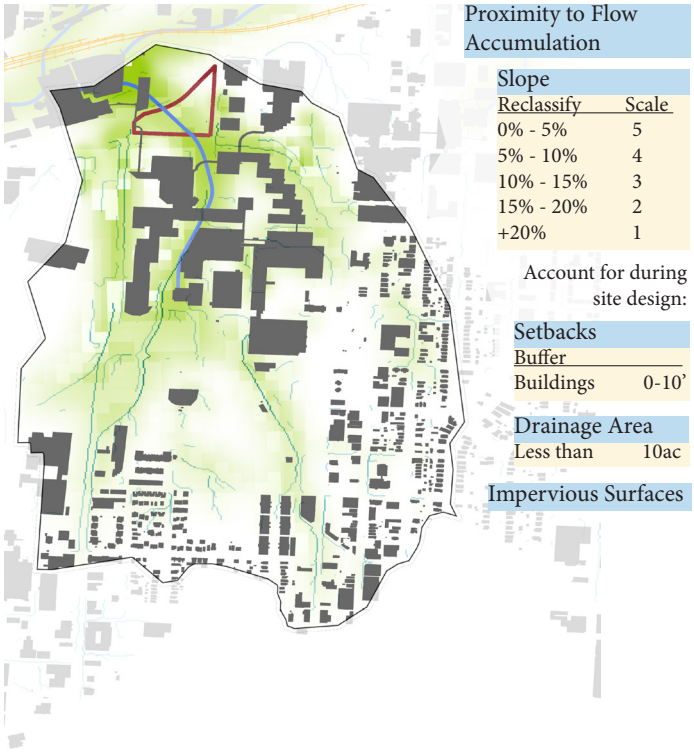
Low High Elevation
Washington Square Park
Flow Accumulation



[5.6]

Washington Square Park
Planned Dropshaft and Pipe
Combined Sewer System
Separate Sewer System

Suitability Factors



Proximity to Flow Accumulation

Slope

Reclassify	Scale
0% - 5%	5
5% - 10%	4
10% - 15%	3
15% - 20%	2
+20%	1

Account for during site design:

Setbacks

Buffer	
Buildings	0-10’

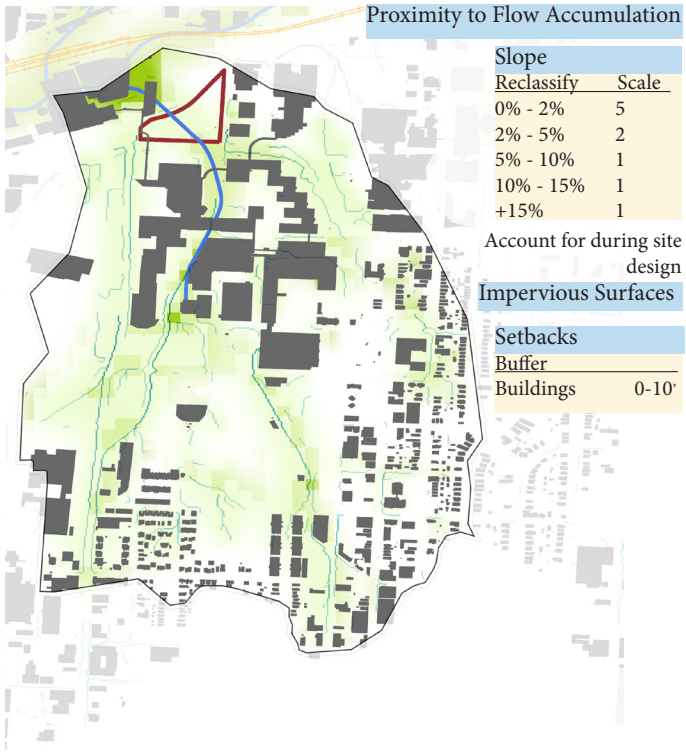
Drainage Area

Less than	10ac

Impervious Surfaces

[5.7]

Suitability Factors



Proximity to Flow Accumulation

Slope

Reclassify	Scale
0% - 2%	5
2% - 5%	2
5% - 10%	1
10% - 15%	1
+15%	1

Account for during site design

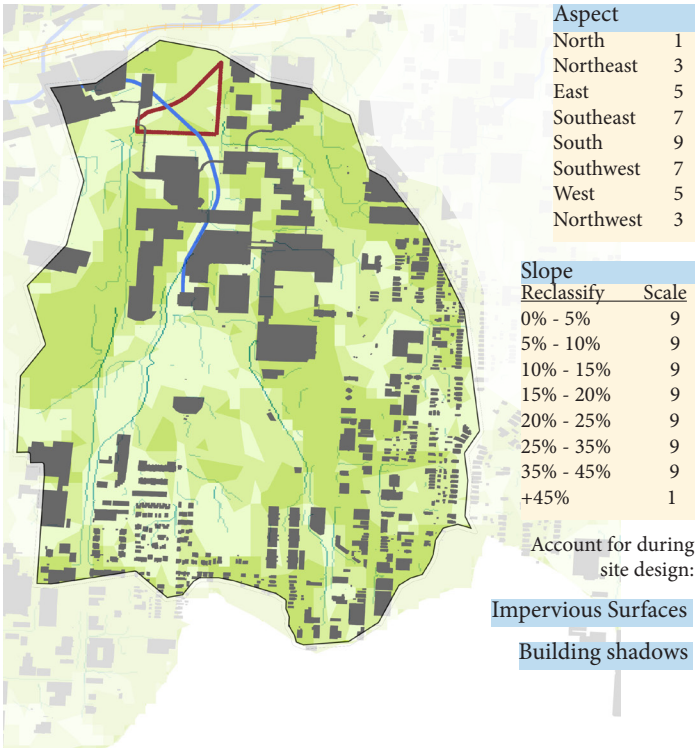
Impervious Surfaces

Setbacks

Buffer	
Buildings	0-10’

[5.8]

Suitability Factors



Aspect

North	1
Northeast	3
East	5
Southeast	7
South	9
Southwest	7
West	5
Northwest	3

Slope

Reclassify	Scale
0% - 5%	9
5% - 10%	9
10% - 15%	9
15% - 20%	9
20% - 25%	9
25% - 35%	9
35% - 45%	9
+45%	1

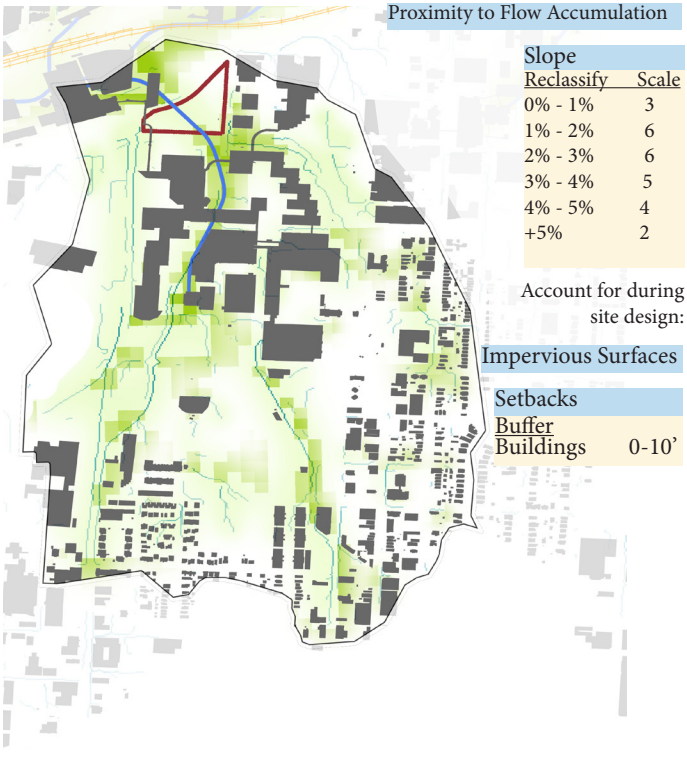
Account for during site design:

Impervious Surfaces

Building shadows

[5.9]

Suitability Factors



Proximity to Flow Accumulation

Slope

Reclassify	Scale
0% - 1%	3
1% - 2%	6
2% - 3%	6
3% - 4%	5
4% - 5%	4
+5%	2

Account for during site design:

Impervious Surfaces

Setbacks

Buffer	
Buildings	0-10’

[5.10]

SUITABLE LOCATIONS FOR GREEN INFRASTRUCTURE STRATEGIES

Through my research and experience in designing with the NUWM Framework, it is clear that in order to design a water infrastructure system that is ecologically sound and desired by the public, one must be familiar with green infrastructure strategies, and know the suitable conditions for each. For this reason I borrowed a methodology from Patrick Ptomey's master's report "Rethinking Rainfall," to analyze suitable locations for different green infrastructure strategies within the watershed boundary. The suitability analyses takes into consideration proximity to water flow accumulation, slope, building setbacks, and slope aspect when identifying suitable areas for green infrastructure strategies (Ptomey 2013). This study analyzed seven strategies: constructed wetlands, vegetated bioswales, native revegetation, rain gardens, infiltration trenches, and green roofs (Figure 5.7-5.10; Appendix H)

Findings from the suitability analysis were considered when defining the Potential Development Boundary, and are directly applied in the design development step of the Design Approach.

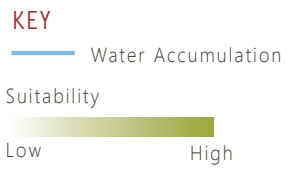


FIGURE 5.7: Suitability Analysis: Wetlands (Author 2014)

FIGURE 5.8: Suitability Analysis: Vegetated Bioswale (Author 2014)

FIGURE 5.9: Suitability Analysis: Native Revegetation (Author 2014)

FIGURE 5.10: Suitability Analysis: Rain Gardens (Author 2014)

Safe-to-Fail Design: a design that will not cause minimal harm or danger to property and people should it fail (Ahern 2013)

Design Recommendations based on Findings

- Make the water infrastructure system a "safe-to-fail" demonstration project by containing it to be closed loop system that treats water from the watershed and recirculates it to be repurposed throughout the development
- Reintroduce the historical Turkey Creek Branch into the development through a system of green infrastructure elements that run through Crown Center
    - Collect all runoff within this system, treating it and reusing it through the development
- Restore the North Parking lot's hydrological functions
    - Catch surface runoff collected and conveyed to the site by the green infrastructure system
- Replace the need to install the drop shaft and pipe plan proposed by Black & Veatch
    - Back up the green infrastructure elements with grey infrastructure elements on the site to catch and retain combined sewer system overflows
- Allow the city to keep the option of installing Black & Veatch's dropshaft and pipe plan by ensuring that the area they allocated for the installation will be easily accessible and not cause damage to the rest of the development if implemented

5.2.2 Social Considerations

Mentally and Physically Connecting People to Hydrologic Functions

There is not one solid social boundary for any site. The largest social boundary for this project is based on the Mid American Regional Council (MARC) survey extents, used to determine community values within this project. These surveys account for the five counties that make up the urban core of Kansas City (Figure 5.12). The second boundary is determined by the rough physical extends of the City plans being considered in this project, the Greater Downtown Area Plan and Making Grand Street Grand. Other fundamental social and cultural considerations such as surrounding land use and businesses are given various levels of priority based on proximity to the site boundaries.

RESEARCH AGENDA

Community Goals

- Review community plans (See Section 2.3.4)
  - Goals and objectives (p. 102-103)
    Physical plans (Figure 5.14)
- Review community surveys (Appendix G)
  - Community values (Figure 5.14)

Historical Background

- Basic history

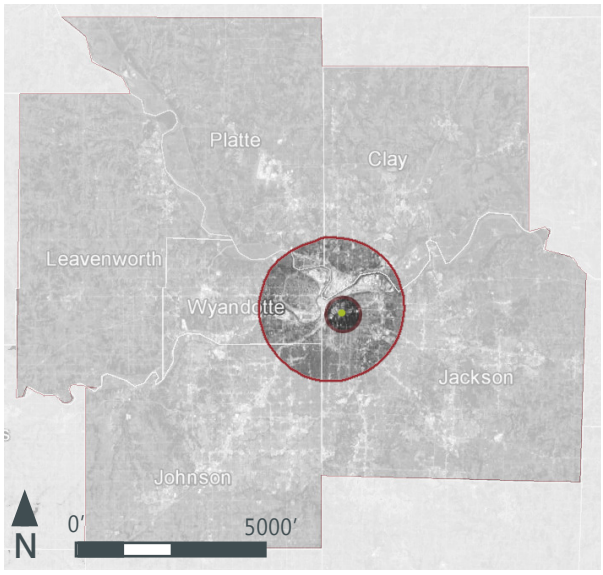
Social and Cultural Nodes

- Destinations (Figure 5.14)
  -note target audience

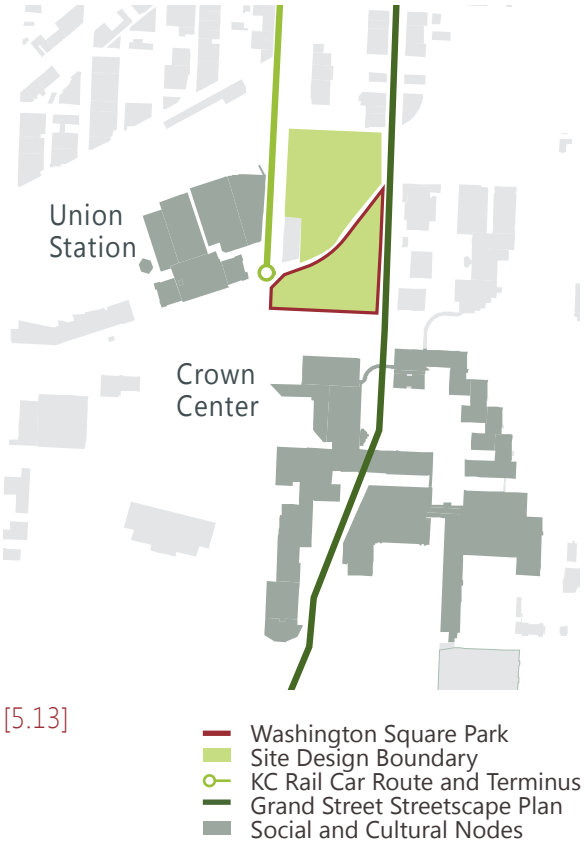
FIGURE 5.11: Research Agenda for Social Consideration Boundary (Author 2014)
This Research Agenda was developed using the methodology described in Section 4.3 of this book. The process of how I translated the paradigm Framework in a Research Agenda for Water Considerations can be viewed in Appendix D

FIGURE 5.12: Social Considerations Boundary: Downtown Kansas City (Author 2014)

FIGURE 5.13: Current City Plans for Redevelopment in the Area (Modified by Author from KCDC 2013)



[5.12]



[5.13]

Historically, Washington Square Park was a civic park, directly connected to Union Station. Before that the sight was a riparian edge of the Turkey Creek. The current general social function of Washington Square Park is a pass through space (KCDC 2013). There are two major social nodes adjacent to Washington Square Park. Directly Northwest of the site is Union Station and to the South is Crown Center (Figure 5.13). Both nodes attract people of all kinds, with many family friendly businesses.

COMMUNITY GOALS AND PLANS

City plans in the area include the KC Rail Car terminus to be located in between Union Station and the West edge of Washington Square Park. The Grand Boulevard Streetscape Plan runs along the Eastern edge of the site and down through Crown Center (Figure 5.13).

Goals from these plans, the Greater Downtown Area Plan, and the Washington Square Park RFQ/P serve as the community and stakeholder goals for the project. A full list of these plans and goals is found in Section 2.3, Figure 2.32.

FIGURE 5.14: Community Values of Downtown Kansas City, Missouri (Modified by Author from MARC 2012)

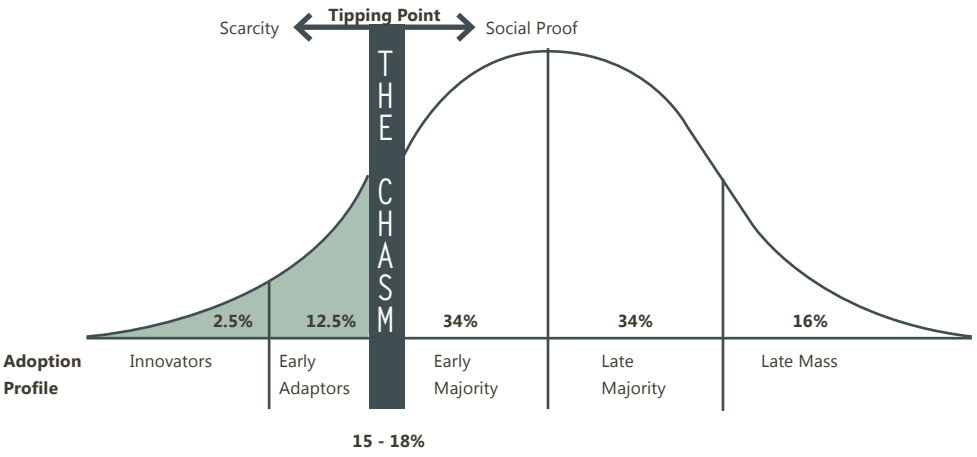


FIGURE 5.15: Law of Diffusion of Innovation (Modified by Author from Sinek 2012)

COMMUNITY VALUES

In order to answer the question "What are the community's values?," two surveys conducted by MARC are referenced (Appendix G). These surveys identify what concerns are greatest in the community. These concerns are translated into values and listed in descending order of concern as Education, Safety from Crime, Water Quality of Water Bodies, Quality of Life for Families, Air Quality, and Property Value. These values aid designers in motivating the community to care about water management through optimizing design elements according to community goals and values.

Other values were listed within these surveys; however, to narrow the options to the most relevant popularly held values, this study only uses those values held by eighteen percent or more of those who took the survey (Figure 5.14). This decision is based upon The Law of Diffusion of Innovation. The Law of Diffusion of Innovation states that in order to cause a shift, or tip the scales of an idea or product being adopted into society, you must convince eighteen percent of the population to buy into it (Sinek 2012). After the first eighteen percent adopt the action or product, it will be considered as the social norm by the "early majority," and the rest will follow suit (ibid).

Design Recommendations Based on Findings

- Use the Grand Street Boulevard Plan to connect Washington Square Park to Crown Center through visual and programmatic continuity
- Place a destination on the South West corner of Washington Square Park to draw people in from the Rail Car Terminus
- Use water infrastructure elements, along with interpretive and symbiotic environmental psychology strategies to link social values to hydrological functions
- Use repurposed City water pipes, being replaced in various areas of the city, throughout the development as public art
- Use repurposed concrete from the Rail Car construction site in the redevelopment of Washington Square Park
- Use familiar water treatment forms and symbols within the design to evoke the idea that the development's hydrological elements are cleaning the water, just as traditional hard infrastructure elements do
- Incorporate signage with green infrastructure elements that emphasize its benefits to education, safety, water quality, quality of life for families, air quality, and property values
- Provide areas for children to play and learn
- Incorporate examples of urban agriculture
- Frame views of the City

5.2.3 Potential Development Considerations

Expanding the Social, Ecological, Economic, and Motivational Affects of the Development

The Potential Development Boundary is determined based on findings from the Social and Water Consideration Boundaries (Figure 5.17). For Washington Square Park, the historical creek branch that runs through Crown Center, and its role and location in the Grand Boulevard Streetscape Plan make it a high priority area to expand Washington Square Park's development efforts into. In fact, without this added redevelopment area, the project does will not likely possess the adequate social, ecological, economic, and motivational affects on the community and environment to make process towards a new approach to water management in Kansas City.

RESEARCH AGENDA

- Land Use and Ownership
  - under utilized lots
  - public land
  - opportunity areas for recycled water usage
  - surrounding business types
- Vernacular
  - landscape materials
  - material safe to repurpose
  - amenities
  - View corridors
  - Street treatments
- Circulation
  - Access points
  - Gateways
  - Connectivity
- Green Infrastructure Suitability

FIGURE 5.16: Research Agenda for Potential Development Boundary (Author 2014)

This Research Agenda was developed using the methodology described in Section 4.3 of this book. The process of how I translated the paradigm Framework in a Research Agenda for Potential Development Considerations can be viewed in Appendix F

CIRCULATION

Major users of the site are probably walking to work from public transit stops and parking lots. The main circulation routes on the site are people walking in the skywalk located at the South West corner of the site, and those transversing the site along the diagonal northern edge of the site.

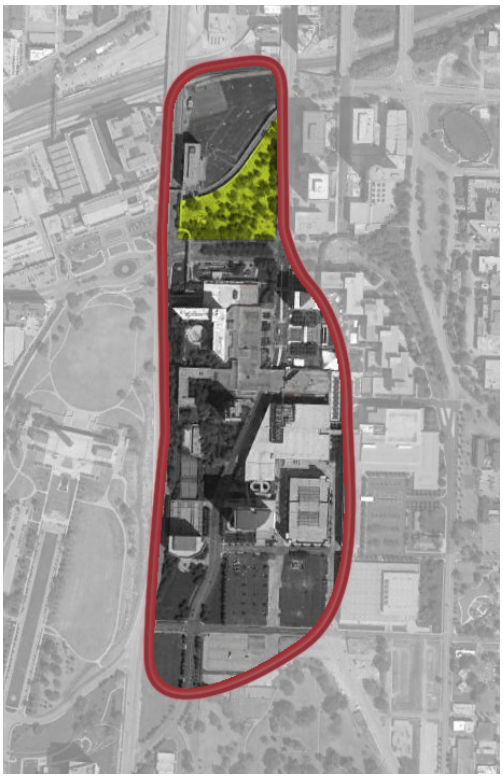


FIGURE 5.17: Development Boundary: Crown Center District (Author 2014)

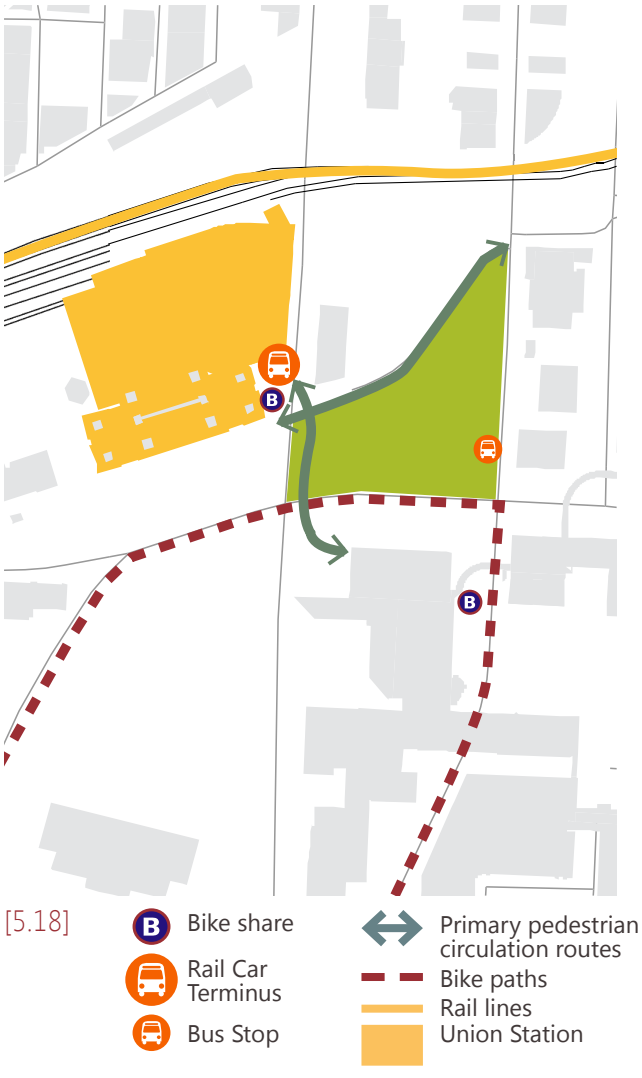


FIGURE 5.18: Washington Square Park Circulation (Modified by Author from KCDC 2013)

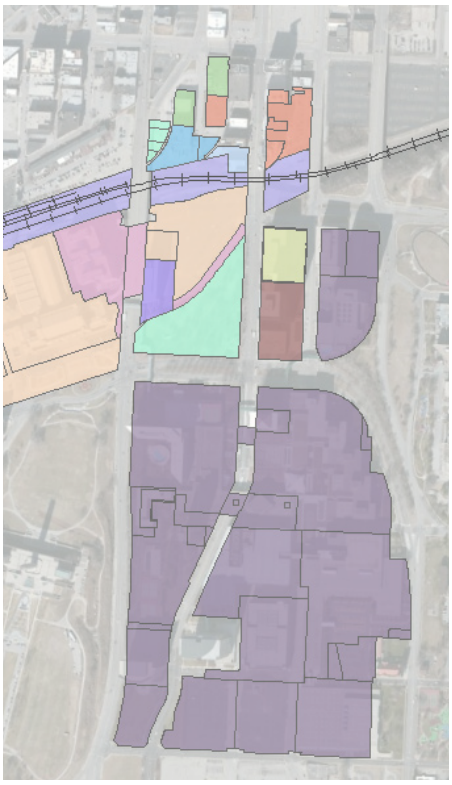


FIGURE 5.19: Land Ownership (State of Missouri 2013)

- Hallmark
- Union Station
- City of Kansas City
- MG2 Development
- Kansas City Terminal Rail
- LA County Employees Retirement
- Belger Carter Services
- Assurant Health
- Superior Moving and Storage
- Blue Cross Blue Shield
- Franklin Street Properties
- United Missouri Bank (UMB)

LAND USE AND OWNERSHIP

Crown Center is owned by one entity, the Hallmark Company (Figure 5.19). This makes the area not only relevant to the hydrologic and social conditions of the site, but also a viable option for a public-private partnership. The Hallmark Company also has a history of partnering with the City's Parks & Recreation Department on sustainable development initiatives. For these reason, the project will assume that Hallmark will cooperate on the Washington Square Park redevelopment efforts, and propose design strategies within the Crown Center area.

FIGURE 5.20: North Western View From Washington Square Park (Butler 2014)

VERNACULAR

The neighborhood surrounding Washington Square Park is a mesh of civic and industrial styles. Placed on the south east corner is a monument to President George Washington, an iconic symbol of the park (Figure 5.21). Looking towards the North from the site's northern edge, white civic balusters physically block pedestrian access while they view the Railroad tracks and City beyond (Figure 5.20; 5.23). The major gateways into the site are the south east and south west corners. The South west corner is a skywalk (Figure 5.22).

FIGURE 5.21: South East Entrance to Washington Square Park (Butler 2014)

FIGURE 5.22: South West Entrance to Washington Square Park (Butler 2014)

FIGURE 5.23: North Easter View From Washington Square Park (Butler 2014)

Design Recommendations based on Findings

- Establish a public-private partnership with the Hallmark Company to extend the physical boundary of the development, connecting the park to the established social hub of Crown Center
- Provide a destination or amenity not offered by the surrounding businesses or land uses
- Establish a physical or visual connection to Crown Center from the site's South-East corner, and to Union Station from the site's Southwest corner
- Program to compliment and optimize the functions of surrounding businesses
- Establish a circulation route within the development that links major destination points, especially public transit routes
- Use the symbolism attached to the Washington statue to reshape the park's identity
- Draw people down from the skywalk with views and programming

Section 5.3: Design Model for Washington Square Park

As described in Section 4.4.2, there are three variables to consider when designing motivational water infrastructure elements - hydrological function, social amenity, and personal relevance. The personal relevance variable is dependant upon the values, goals, and issues of the specific community. This project draws upon Kansas City documents and surveys to compile a list of goals and values to consider when designing for the Washington Square Park redevelopment project.

The goal is to achieve or support each objective within the redevelopment project, which also includes strategies for the Crown Center District.

I. HYDROLOGIC FUNCTION

Mimic and Work with Nature

- Provide ecological flow to rivers and reservoirs
- Restore natural drainage
- Provide habitat
- Balance viable biota
- Reduce erosion
- Minimize subsurface drainage
- Integrate grey and green infrastructure
- Reclaim and reuse water to create closed water resource cycles

FIGURE 5.24: NUWM Motivational Model for Washington Square Park (Author 2014)

II. SOCIAL AMENITY

Expose Functions

- Bring water to the surface
- Create systems that visibly collect and store water and pollution
- Create overlooks with views of the water system
- Place water systems in social hubs or make the water system a destination
- Provide paths to the water system that connects to existing trails
- Provide clear points of entry into the water system
- Provide seating with views of the water system
- Create water systems that are touchable

Foster Mindfulness

- Provide informational signage and exhibits
- Create a narrative of the water system
- Create symbols of past watershed conditions
- Make stormwater related artifacts integral to the design
- Engage thinking with something surprising

Create opportunities for competence, skills, and knowledge

- Provide opportunities for people to demonstrate sustainable water practices
- Nurture networks that spread and support sustainable water practices
- Communicate effective action
- Invite educational games or activities

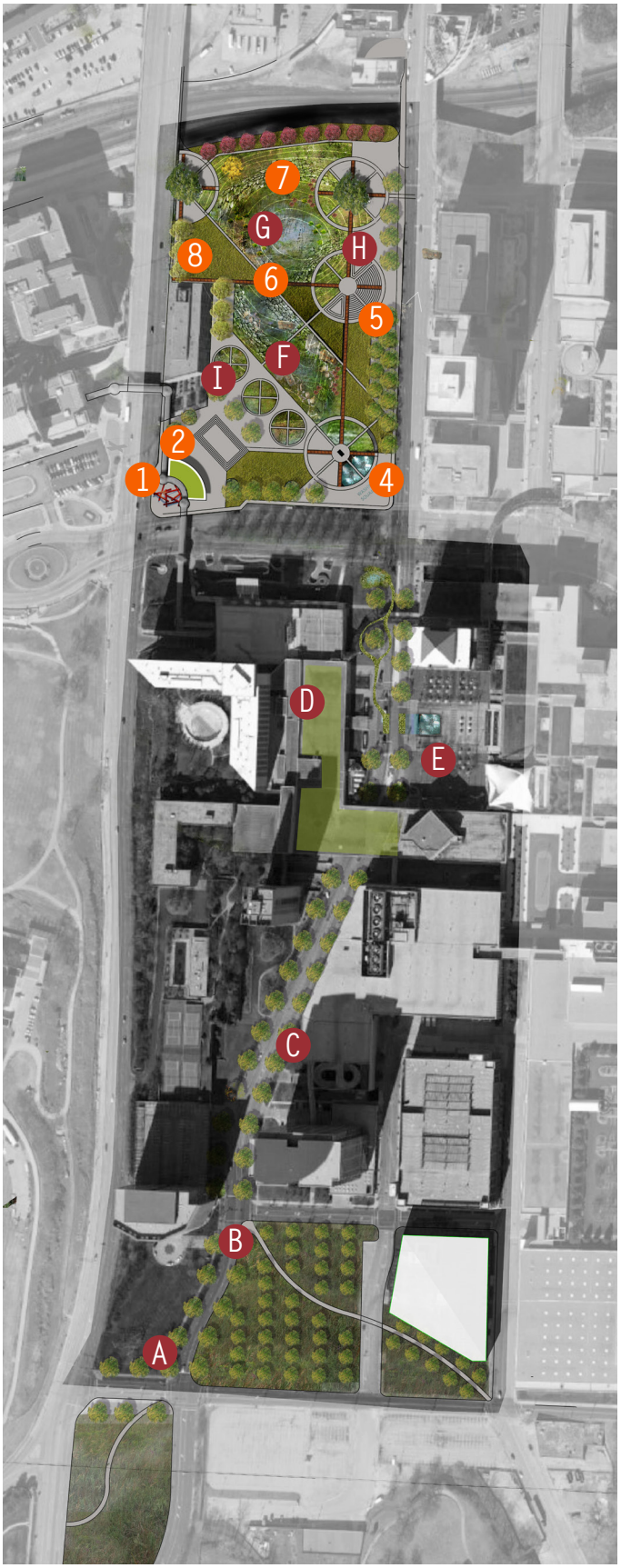
III. PERSONAL RELEVANCE

Community Values

- Education
- Safety from crime
- Protecting water quality of water bodies
- Quality of life for children and families
- Air quality
- Property value

Community Goals

- Implement green stormwater management strategies
- Provide public art to express local identity and history
- Washington Square Park as a gathering hub
- Walkable downtown
- KC as an emerging "Green City"
- Aesthetic community Benefit
- Address combined sewer system overflows (CSOs)
- Minimize Waste and Increase Efficiencies
- Use the Public Realm as a Marketing Tool for Environmental Stewardship



DISTRICT WATER INFRASTRUCTURE SYSTEM

- A Street Tree Nursery Gateway
- B Streetscape Treatment
- C Rain Barrels and Cisterns
- D Green Roof Observation Deck
- E Aquatic Play Plaza and Creek Trail
- F Turkey Creek Branch
- G Constructed Wetland
- H Temporal Water Reservoirs
- I Temporal Water Reservoir/ Multi-Purpose Court

SITE DESIGN STRATEGIES FOR WASHINGTON SQUARE PARK

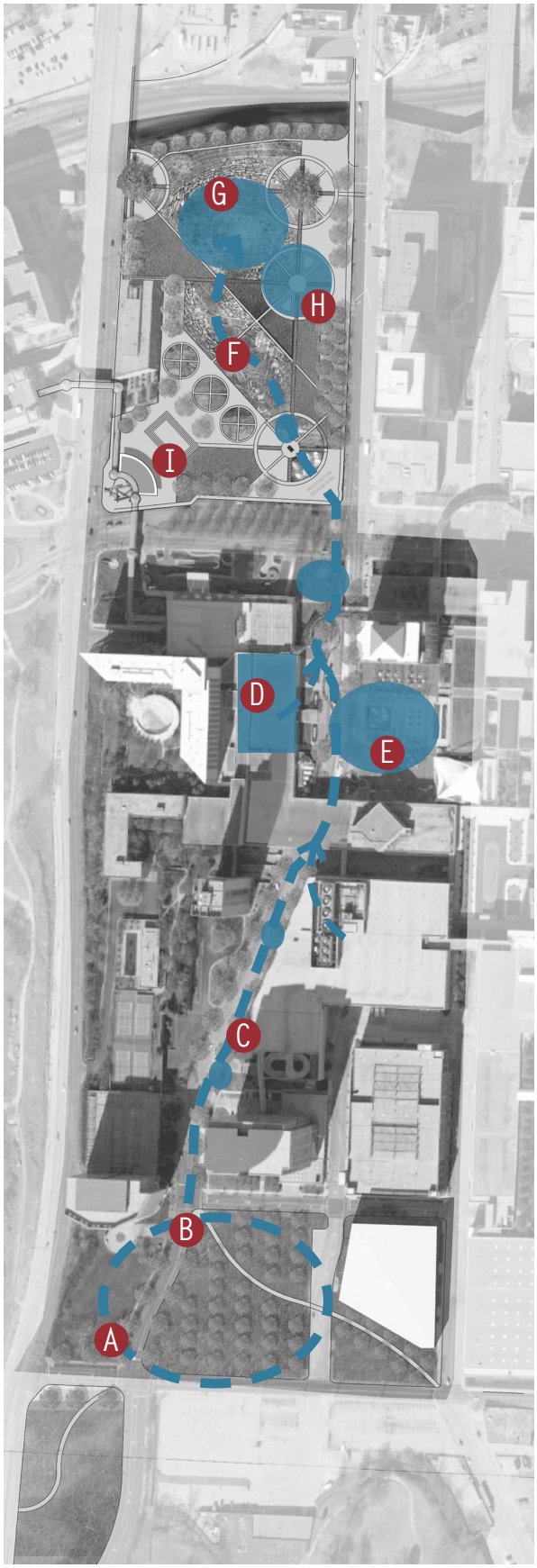
1. Water Pipe Art
2. Cafe / Roof Garden
3. Entry Fountain
4. Amphitheater
5. Overlook Paths
6. Rock Seating
7. Meadow Lawns

Section 5.4: Design Development

Multiple iterations of the Framework and Motivational Model's organizational structure site analysis, design development, reflection, and adjusting were explored to arrive at the final master plan design. The stopping procedure for the design process was to fulfill the original principles and objectives of the NUWM Framework.

Using the Motivational Model, I identified suitable locations and functions of hydrologic elements for the water infrastructure system; second, I created system of visual and physical connectivity between people and hydrological functions, exposing visitors to the site's water amenities. Finally, the design strategies were manipulated to expose the personal relevance of the hydrologic functions through interpretive and symbiotic strategies. Example strategies include incorporating symbols and educational activities within the design, and less interpretive and symbiotic strategies, such as signage. The three variables of hydrologic function, social amenity, and personal relevance guide the overall concept of the design down to the specific design strategies within each element. These concepts and strategies are explained in this section.

◀ FIGURE 5.25: Design Development Plan (Author 2014)



A Green Gateway

B Streetscape Treatment

C Rain Barrels and Cisterns

D Green Roof Observation Deck

E Aquatic Play Plaza and Creek Trail

F Turkey Creek Branch

G Constructed Wetland

H Temporal Water Reservoirs

I Temporal Water Reservoir/ Multi-Purpose Court

FIGURE 5.26: District Strategy - Hydrologic Functions (Author 2014)

5.4.1: District Strategy

I. HYDROLOGIC FUNCTION

An integrated system of green and gray water infrastructure is placed along the Grand Street corridor in the Crown Center District. This system is designed to mimic the historical hydrology of the site, catching most of the surface run-off in the district, and sending it through a series of water infrastructure elements to be filtered of trash and contaminants. The elements are connected to flow into Washington Square Park. Within Washington Square Park, the water is further treated in a "day lit" creek bed that feeds into a constructed wetland.

After treatment, if the water has not infiltrated into the ground, it is recirculated back into the surrounding buildings for flushing, and to water features for reuse. The closed-loop functions of this system is necessary for two reasons. One, the development is isolated from any real natural hydrologic water source; it cannot feed into a creek or reservoir. Two, this is the first large public water-centric development of its kind in Kansas City. There are many lessons to be learned from its installation; therefore, it should be designed as "Safe-to-fail." In this way the development serves as an experimental landscape for the city. Here, the city can test new strategies, develop quantitative data for the system, and instill confidence in the community towards the efficacy and viability of this approach to future stormwater management and development.

Three Lines of Defense Against Flooding and Contaminants

#1 Green Infrastructure Elements

Guided by suitability analysis done for seven best management practices, the design includes permeable paving, streetscape bioswales, box trees, rain gardens, infiltration trenches, a "day lit" historical creek branch, and a constructed wetland. These elements slow down water, treating and containing it, then slowly releasing it to the next part of the system. This prevents flash flooding as well as provides the water an opportunity to recharge into the ground. Some elements cannot provide ground recharge, as they are located on impervious surfaces. These elements feed into underground cisterns, or above ground rain barrels, to be stored and reused in the buildings.

#2 Gray Infrastructure: Temporal Water Reservoirs

Placed within Washington Square Park are depreciated seating and play areas that serve as water catchment basins during wet weather. There are also larger water reservoirs hidden below the exposed basins. These catchments are used to contain the CSOs from the connector pipe that runs beneath the North edge of Washington Square Park. The pipes need not be moved, as they are already in the right location to feed water into the site (that is why Black & Veatch proposed their drop shaft and pipe plan here). Once the wet weather event is over, the reservoirs will slowly release their content into the wetland for treatment and recirculation.

#3 "Dropshaft and pipe" option as back-up plan for the future

The below ground reservoirs will be hollow when empty, making it easy to access the large space below with little disruption to the rest of the development, specifically the wetland. Should the city need to execute Black & Veatch's engineered plan in the future, they will be able to do so by going into the reservoir and placing their dropshaft and pipe. After it is installed, the city can choose to recap the reservoirs as it was, or block it off, allowing visitors to look down upon the dropshaft, which would also provide an informational experience to visitors.

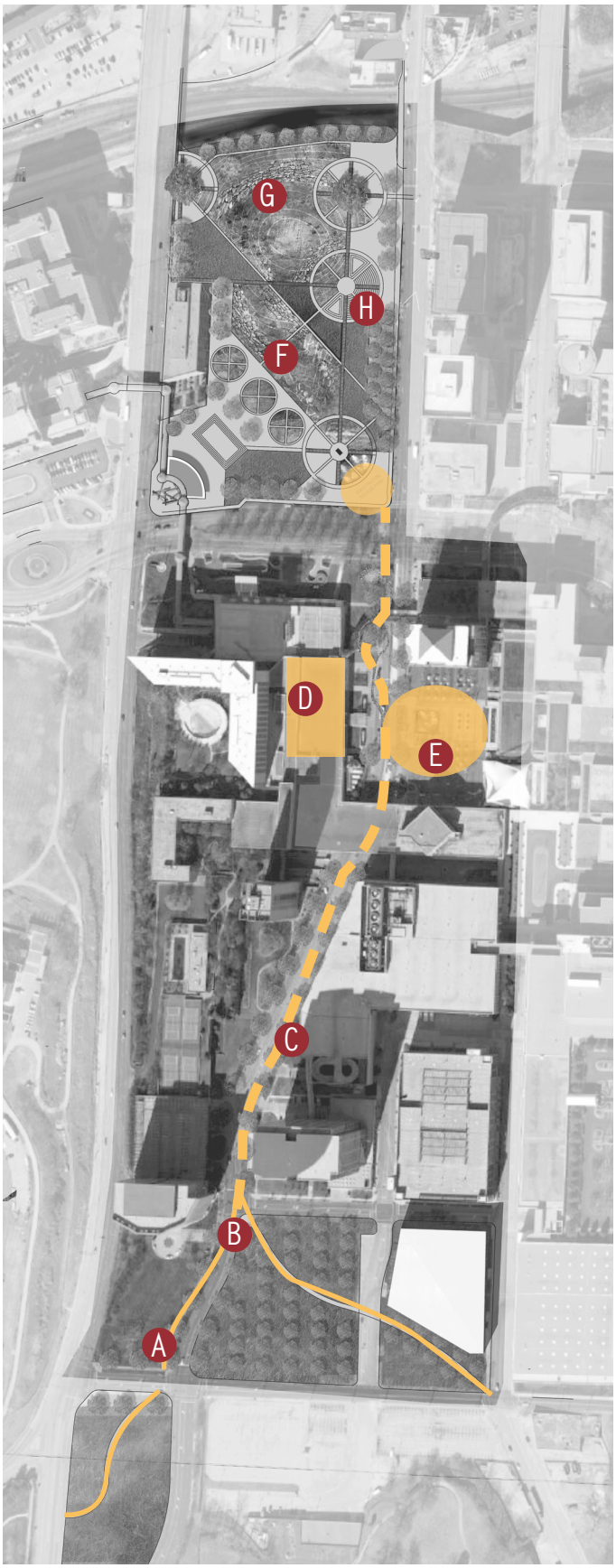
II. SOCIAL AMENITY

Major circulation paths encounter the water infrastructure elements. Paths are added to the South of Crown Center, connecting the district to existing off-site bike and pedestrian trails.

Seating is placed along the pedestrian paths leading up through Crown Center. These benches are shaded by the box trees and incorporate sculptural elements of the city's repurposed water pipes. Breaking up the path are small rain gardens, native vegetation, and rain barrels. Specific amenities within the district water infrastructure system, such as the Roof Top Observation Deck, and the Aquatic Play Plaza are elaborated on later in this section.

Major gateways to Washington Square Park are clearly marked with signage, sculptures, or water features. The main gateway welcoming people from Crown Center to Washington Square Park is especially pronounced in order to draw people into the park from Crown Center. This feature is illustrated and elaborated upon on page 172.

Specific design strategies for Washington Square Park are explained and illustrated in Section 5.4.2: Design Strategies.



A Green Gateway

B Streetscape Treatment

C Rain barrels and Cisterns

D Green Roof Observation Deck

E Aquatic Play Plaza and Creek Trail

F Turkey Creek Branch

G Constructed Wetland

H Temporal Water Reservoirs

I Temporal Water Reservoir/ Multi-Purpose Court

FIGURE 5.27: District Strategy - Social Amenities (Author 2014)

II. PERSONAL RELEVANCE

Exposing the personal relevance of the design to visitors at Crown Center is important in order to convince them to visit Washington Square Park. Adding additional informational water elements and signage to existing social nodes can retrofit Crown Center into a motivational water-centric development. Exposing the hydrological functions is the first step to fostering mindfulness, a key environmental psychology strategy for motivating change. From this base-point the design strategies engage and educate visitors, creating experiences that appeal to their personal values and goals, and support local issues and efforts. Specific design strategies for revealing and supporting community, values, goals, and efforts are explaining in this section.

Design strategies that support community values, goals, and efforts

A Green Gateway

B Streetscape Treatment

C Rain Barrels and Cisterns

D Green Roof Observation Deck

E Aquatic Play Plaza and Creek Trail

F Turkey Creek Branch

G Constructed Wetland

H Temporal Water Reservoirs

I Multi-Purpose Court

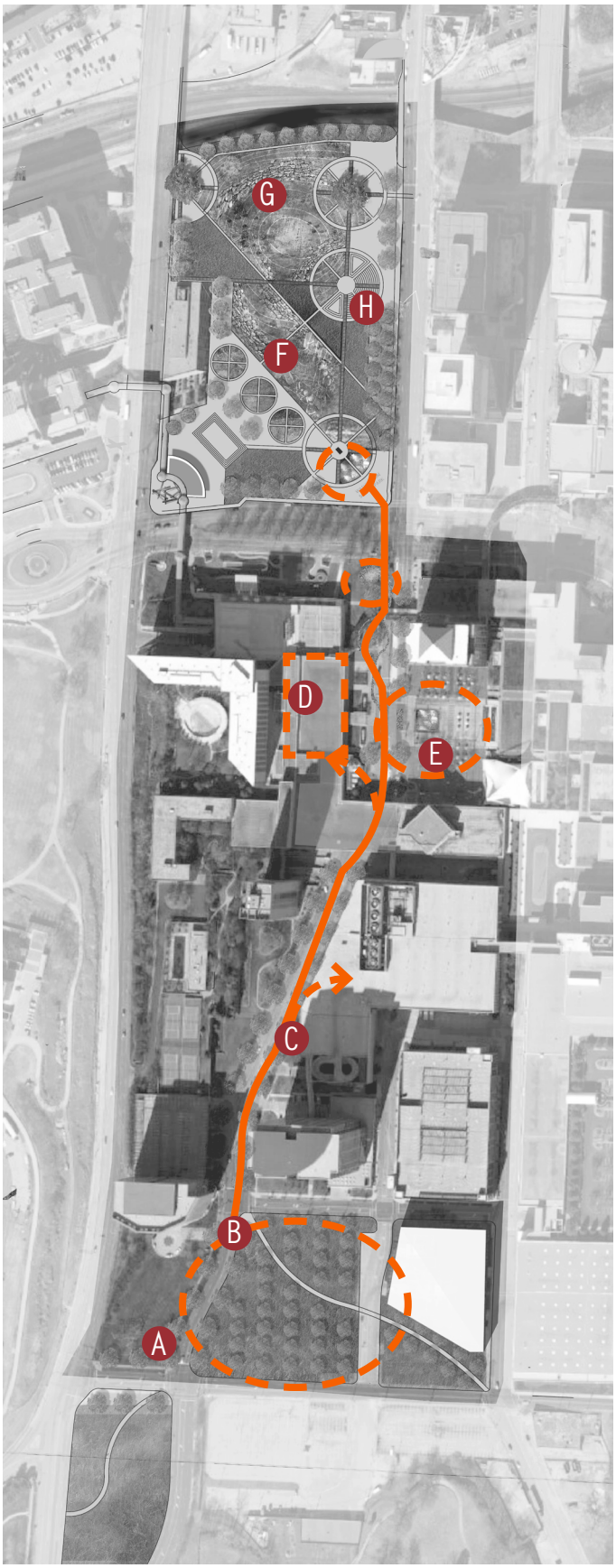


FIGURE 5.28: District Strategy - Personal Relevance (Author 2014)

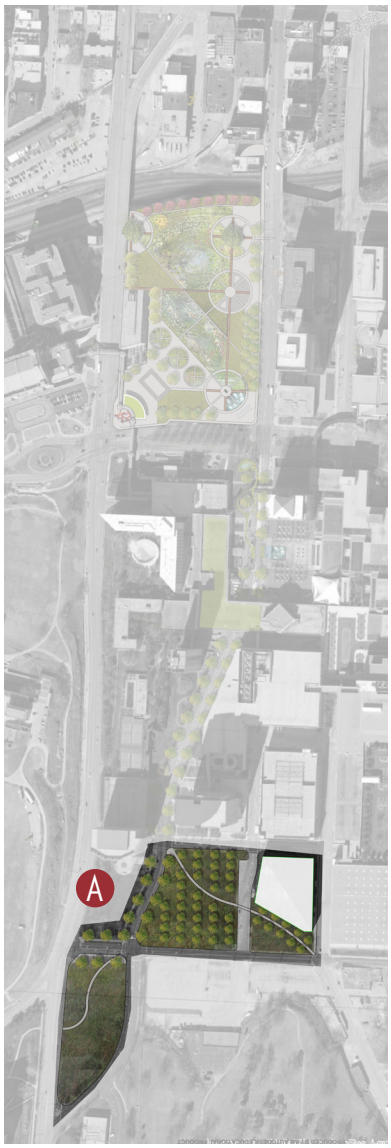


FIGURE 5.29: Design Strategies A Context Key (Author 2014)

I. HYDROLOGIC FUNCTION

Mimic and Work with Nature

- Provide Habitat
- Balance Viable Biota
- Reduce Erosion
- Minimize subsurface drainage
- Reclaim and reuse water to create closed water resource cycles

FIGURE 5.30: Fulfilled Motivational Model for Design Strategy A (Author 2014)

A Street Tree Nursery Gateway

Surface parking at the South entrance of Crown Center is planted as an urban tree nursery for the city to grow street trees. The new "green" entrance introduces the district's new identity as a sustainable development to users. New signage and art pieces provide informational cues of care. Pedestrian pathways connect to off site circulation points and bike trails. Informational signage is placed along pathways for users to learn about the ecological benefits of revegetation. These signs emphasize clean air, water infiltration, and habitat creation. This amenity also serves as a flexible recreation space for joggers and those wishing to find a retreat from the city. Seating is provided throughout the meadow to encourage reflection. These seating areas are accented with art made from the remnants of old water infrastructure pipes, accompanied by informational signs.

II. PHYSICAL AMENITY

Expose Functions

- Provide paths to the water system that connects to existing trails
- Provide clear points of entry into the water system

Foster Mindfulness

- Provide informational signage and exhibits
- Make stormwater related artifacts integral to the design

Create opportunities for competence, skills, and knowledge

- Nurture networks that spread and support sustainable water practices

III. PERSONAL RELEVANCE

Community Values

- Protecting Water Quality of Water Bodies
- Quality of Life for Children and Families
- Air Quality
- Property Value

Community Goals

- Implement Green Stormwater Management Strategies
- Walkable Downtown
- KC as an Emerging "Green City"
- Aesthetic Community Benefit
- Minimize Waste and Increase Efficiencies

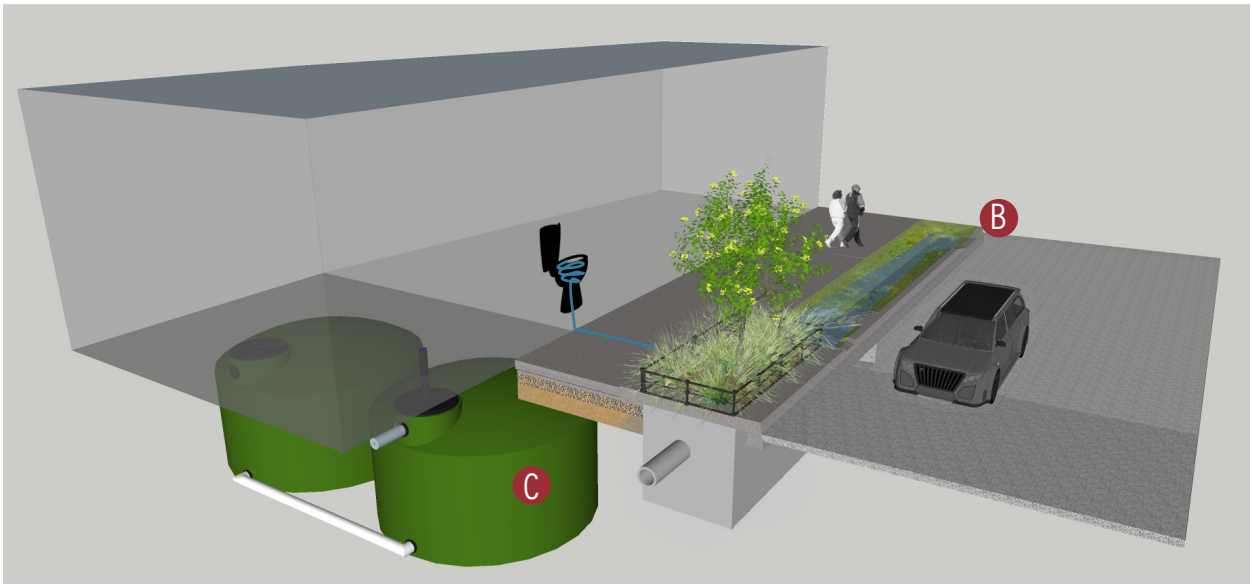


FIGURE 5.31: Streetscape Treatment Concept Montage (Author 2014)

I. HYDROLOGIC FUNCTION

Mimic and Work with Nature

- Restore Natural Drainage
- Provide Habitat
- Balance Viable Biota
- Reduce Erosion
- Minimize subsurface drainage
- Integrate grey and green infrastructure
- Reclaim and reuse water to create closed water resource cycles

FIGURE 5.32: Fulfilled Motivational Model for Design Strategies B and C (Author 2014)

B Streetscape Treatment

Street trees and curb cuts are placed along the street to catch and treat stormwater runoff. Simple elements are added to the installation to transform it into an informational diagram that illustrates how the water being collected from the street is being used in the buildings for toilet flushing.

The new streetscape is also an aesthetic amenity that is already part of the City's Making Grand Street Grand plan. The installation adds shade to paths and further separates pedestrians from automobiles—increasing walkability and safety

C Rainbarrells and Cisterns

Large underground cisterns provide flushing water for the surrounding buildings, while rain barrels are placed above ground within sight of the main pedestrian path through Crown Center. Rain barrels catch rain from the building roofs, treat it, and reuse the water to grow vegetation in planters along the stark sides of the buildings. Like the street trees and curb cuts, these rain barrels drain into cisterns. The rain barrels demonstrate a green infrastructure strategy that people can implement at their own homes.

II. PHYSICAL AMENITY

Expose Functions

- Bring water to the surface
- Create systems that visibly collect and store water and pollution
- Provide paths to the water system that connects to existing trails
- Provide clear points of entry into the water system

Foster Mindfulness

- Provide informational signage and exhibits
- Make stormwater related artifacts integral to the design

Create opportunities for competence, skills, and knowledge

- Nurture networks that spread and support sustainable water practices

III. PERSONAL RELEVANCE

Community Values

- Protecting Water Quality of Water Bodies
- Quality of Life for Children and Families
- Air Quality
- Property Value

Community Goals

- Implement Green Stormwater Management Strategies
- Walkable Downtown
- KC as an Emerging "Green City"
- Aesthetic Community Benefit
- Minimize Waste and Increase Efficiencies

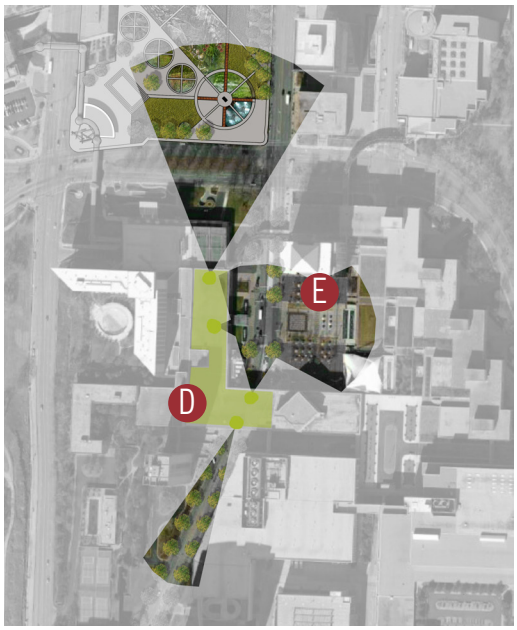


FIGURE 5.33: Design Strategies D and E Context Key and Greenroof View sheds (Author 2014)

D Green Roof Observation Deck

A demonstration green roof at Crown Center is accessible to visitors and workers of the Crown Center Mall. The roof provides outdoor areas for seating, socializing, and staging performances. From the roof one can access grand views of downtown Kansas City. One can also get a full view of the water infrastructure system that runs through the Crown Center District into Washington Square Park. To assist visitors in understanding the hydrologic system they are viewing, informational kiosks are placed around the roof, pointing out each element and describing its social, ecologic and economic benefits (Figure 5.33).

I. HYDROLOGIC FUNCTION

Mimic and Work with Nature

- Provide Habitat
- Balance Viable Biota
- Reduce Erosion
- Minimize subsurface drainage
- Integrate grey and green infrastructure
- Reclaim and reuse water to create closed water resource cycles

FIGURE 5.34: Fulfilled Motivational Model for Design Strategies D and E (Author

E Aquatic Play Plaza

Crown center currently has a plaza that contains interactive water fountains, shade trees, and seating. A few alterations to this space can transform it into an educational amenity for families and begin to narrate about the ecological functions of water. The space still offers interactive shooting fountains; however, they will be presented as a fresh spring. Instead of draining into a drain, the water will runoff into a flat surface where families can wade through, then flow into a faux creek that flows into Washington Square Park. This creek conceptually and physically connects Crossroads to Washington Square Park, serving as a guiding element for users. The creek will also have informational signs along it, describing how Turkey Creek Branch has been buried and replaced by pipes. At key places along the Creek, it will be concealed in exposed water pipes to illustrate the point that these creeks can replace the traditional gray infrastructure systems, and provide social and ecological benefits.

II. PHYSICAL AMENITY

Expose Functions

- Bring water to the surface
- Create Overlooks with Views of the water system
- Place water systems in social hubs or make the water system a destination
- Provide paths to the water system that connects to existing trails
- Provide seating with views of the water system
- Create water systems that are touchable

Foster Mindfulness

- Provide informational signage and exhibits
- Create a narrative of the water system
- Create symbols of past watershed conditions
- Make stormwater related artifacts integral to the design

Create opportunities for competence, skills, and knowledge

- Provide Opportunities for people to demonstrate sustainable water practices
- Nurture networks that spread and support sustainable water practices
- Invite educational games or activities

III. PERSONAL RELEVANCE

Community Values

- Education
- Quality of Life for Children and Families
- Property Value

Community Goals

- Implement Green Stormwater Management Strategies
- Walkable Downtown
- KC as an Emerging "Green City"
- Aesthetic Community Benefit
- Address Combined Sewer System Overflows
- Minimize Waste and Increase Efficiencies
- Use the Public Realm as a Marketing Tool for Environmental Stewardship

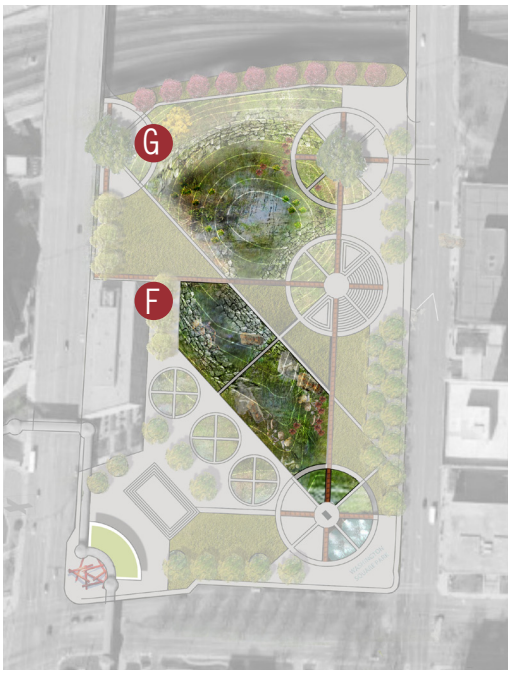


FIGURE 5.35: Design Strategies F and G Context Key (Author 2014)

F Turkey Creek Branch

The faux creek extends from the Crown Center Plaza, weaves down Grand Boulevard, and empties into a large civic fountain at the Southeast entrance of Washington Square Park. This fountain overflows into the reconstructed "Turkey Creek Branch". This green infrastructure element is designed to look and function as the historical Turkey Creek Branch, which transected the site in the 1900s, before it was piped underground. This water way will

I. HYDROLOGIC FUNCTION

Mimic and Work with Nature

- Provide ecological flow to rivers and reservoirs
- Restore natural drainage
- Provide habitat
- Balance viable biota
- Reduce erosion
- Minimize subsurface drainage
- Integrate grey and green infrastructure
- Reclaim and reuse water to create closed water resource cycles

FIGURE 5.36: Fulfilled Motivational Model for Design Strategies F and G (Author 2014)

G Constructed Wetland

demonstrate the ecological functions and benefits of urban streams. Since the water is primarily coming from the Crown Center's interactive water feature, it is clean and safe to play in, just as a natural healthy stream would be. The Turkey Creek Branch drains into the constructed wetland at Washington Square Park's "Water Treatment Plant."

The constructed wetland is located at the lowest point of the watershed, an ideal location as identified by the suitability analysis in Figure 5.7. The wetland is an ecological destination for downtown Kansas City. Hydrologically, the wetland slows down, absorbs, and treats water before it enters the sewer system or is recirculated into the surrounding water features and buildings. It is a social destination because if offers various opportunities for passive and active interaction between water and visitors.

II. PHYSICAL AMENITY

Expose Functions

- Bring water to the surface
- Place water systems in social hubs or make the water system a destination
- Create water systems that are touchable

Foster Mindfulness

- Create symbols of past watershed conditions

III. PERSONAL RELEVANCE

Community Values

- Education
- Protecting water quality of water bodies
- Quality of life for children and families
- Air quality

Community Goals

- Implement green stormwater management strategies
- Washington Square Park as a gathering hub
- KC as an emerging "Green City"
- Aesthetic community benefit
- Address Combined Sewer System Overflows (CSOs)
- Use the public realm as a marketing tool for environmental stewardship

FIGURE 5.37: Water Treatment Plant[s] Perspective (Author 2014)

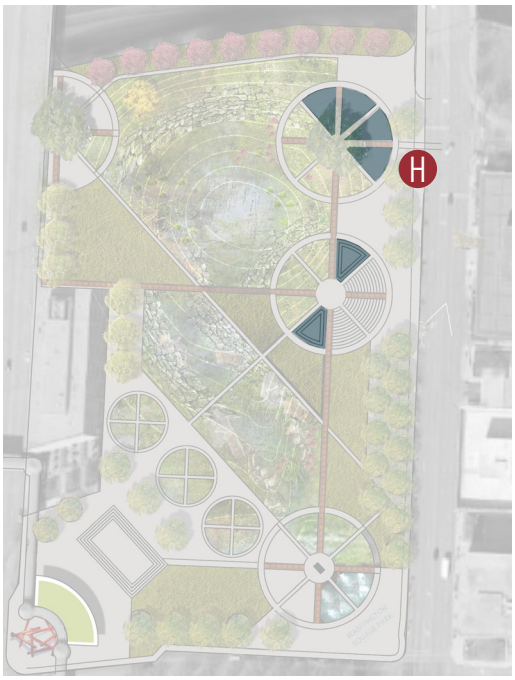


FIGURE 5.38: Design Strategy H Context Key (Author 2014)

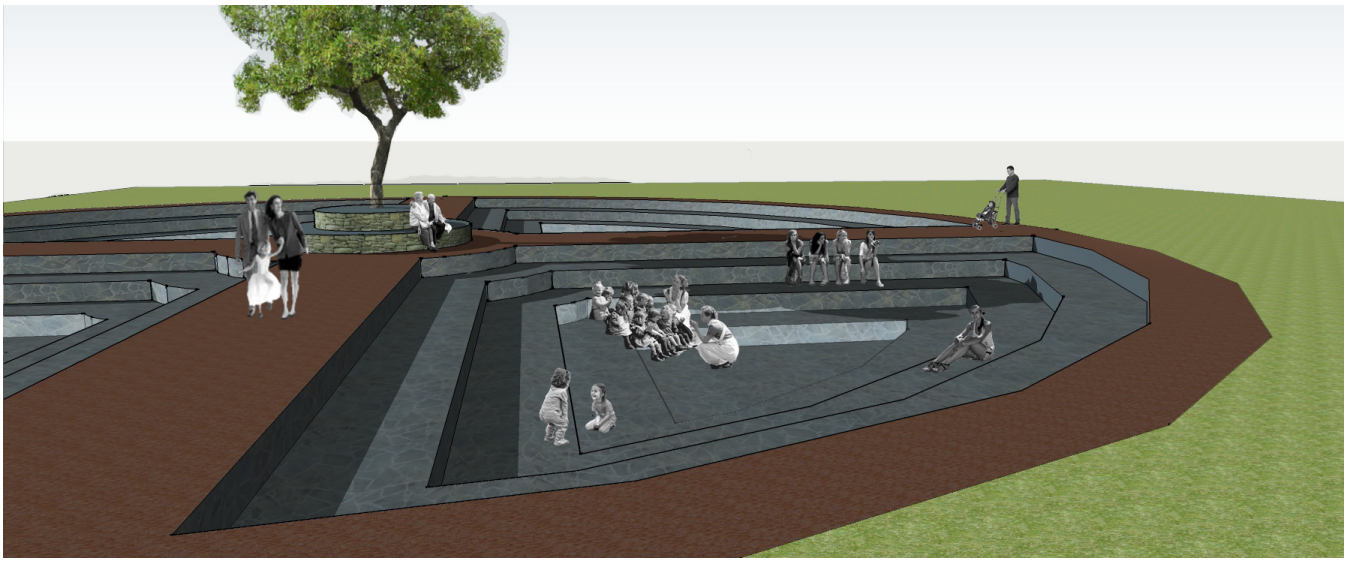


FIGURE 5.39: Water Reservoirs During Dry Weather (Author 2014)

H Temporal Water Reservoirs

During dry weather these depressed spaces serve as seating and gathering areas. During rain events, they fill up with water, and slowly release it into the wetland. The reservoirs provide another level of defense against flooding and CSOs. The site is located at the junction of major sewer pipes, allowing it to intercept extra water from the system. Together, the wetland and reservoirs should hold enough water to prevent the city from making expensive improvements to the sewer system as recommended by Black & Veatch. However, the placement of the water reservoirs allow the hard infrastructure option to be available for the future. Should the city decide to execute the drop shaft and pipe scenario, they can simply place the dropshaft in the hollow reservoir beneath the North East "treatment tank," and place the pipe along its originally planned alignment with little damage to the wetland.

FIGURE 5.40: Water Reservoirs After a Rain Event (Author 2014)

FIGURE 5.42: Design Strategy I Context Key (Author 2014)

I. HYDROLOGIC FUNCTION

Mimic and Work with Nature

- Integrate grey and green infrastructure
- Reclaim and reuse water to create closed water resource cycles

FIGURE 5.41: Fulfilled Motivational Model for Design Strategy H & I (Author 2014)

I Temporal Water Reservoir/Multi-Purpose Court

A depressed court accommodates recreational activities for all age groups. During dry weather users can play basketball, kickball, or gather for small community events. During rain events, the court fills up with water, serving as a temporary reservoir. When the court is holding water, users can sit and view the pool from its steps, or from the surrounding tables while eating lunch.

II. PHYSICAL AMENITY

Expose Functions

- Bring water to the surface
- Create systems that visibly collect and store water and pollution
- Create overlooks with views of the water system
- Provide paths to the water system that connects to existing trails

Foster Mindfulness

- Provide informational signage and exhibits
- Make stormwater related artifacts integral to the design
- Engage thinking with something surprising

Create opportunities for competence, skills, and knowledge

- Communicate effective action
- Invite educational games or activities

III. PERSONAL RELEVANCE

Community Values

- Education
- Protecting water quality of water bodies

Community Goals

- Address combined sewer system overflows

FIGURE 5.43: The Water Treatment Plant[s] Concept Montage (Author 2014)

5.4.2 Site Design Strategies: The Water Treatment Plant[s] at Washington Square Park

Design Concept Based in Environmental Psychology

The Water Treatment Plant[s] at Washington Square Park is designed to draw attention to the fact that ecological functions can provide all the services of a Wastewater Treatment Plant (WWTP). By evoking aesthetic aspects of a WWTP, and filling in the framework with aquatic plants, people will be surprised and compelled to make the connection that plants and ecological functions can replace engineered solutions.

The design is a system of green infrastructure, placed and connected to mimic the historical hydrology of the site. However, the historical system used to drain into the Turkey Creek, which is now the railroad right-of-way. This inhibited the design from fully restoring the watershed's natural hydrologic functions. For this reason, the design needed to be a closed-loop system, as there was not an option to connect it to its original point of discharge. Within the closed-loop system, the wetland and day lit stream provide infiltration, treatment, and absorption before recirculating the water into surrounding buildings and water features. Due to the closed-loop system recirculating treated water, the ecological services of the green infrastructure system is not fully tested. This allows the installation to be interactive, as well as safe-to-fail; if the system fails, little harm will come to the area as far as contaminated water or flooding.

Much like Tanner Spring Park in Portland, the main purpose of the installation is to catalyze the paradigm into adoption by the community. When this shift in thinking and developing happens, and more green infrastructure is installed in the watershed, reducing impervious surfaces and contaminates entering the development's water infrastructure system, then the system can be altered to truly carry out its ecological services. Until then, it will function more or less as a closed system, largely disconnected from the natural hydrological cycle of the water shed; however, considering it in it's design for future adaptation.

SITE DESIGN STRATEGIES FOR WASHINGTON SQUARE PARK

1. Water Pipe Art
2. Cafe / Roof Garden
3. Test Pools
4. Entry Fountain
5. Amphitheater
6. Overlook Paths
7. Rock Seating
8. Meadow Lawns

FIGURE 5.44: Washington Square Park Site Plan (Author 2014)

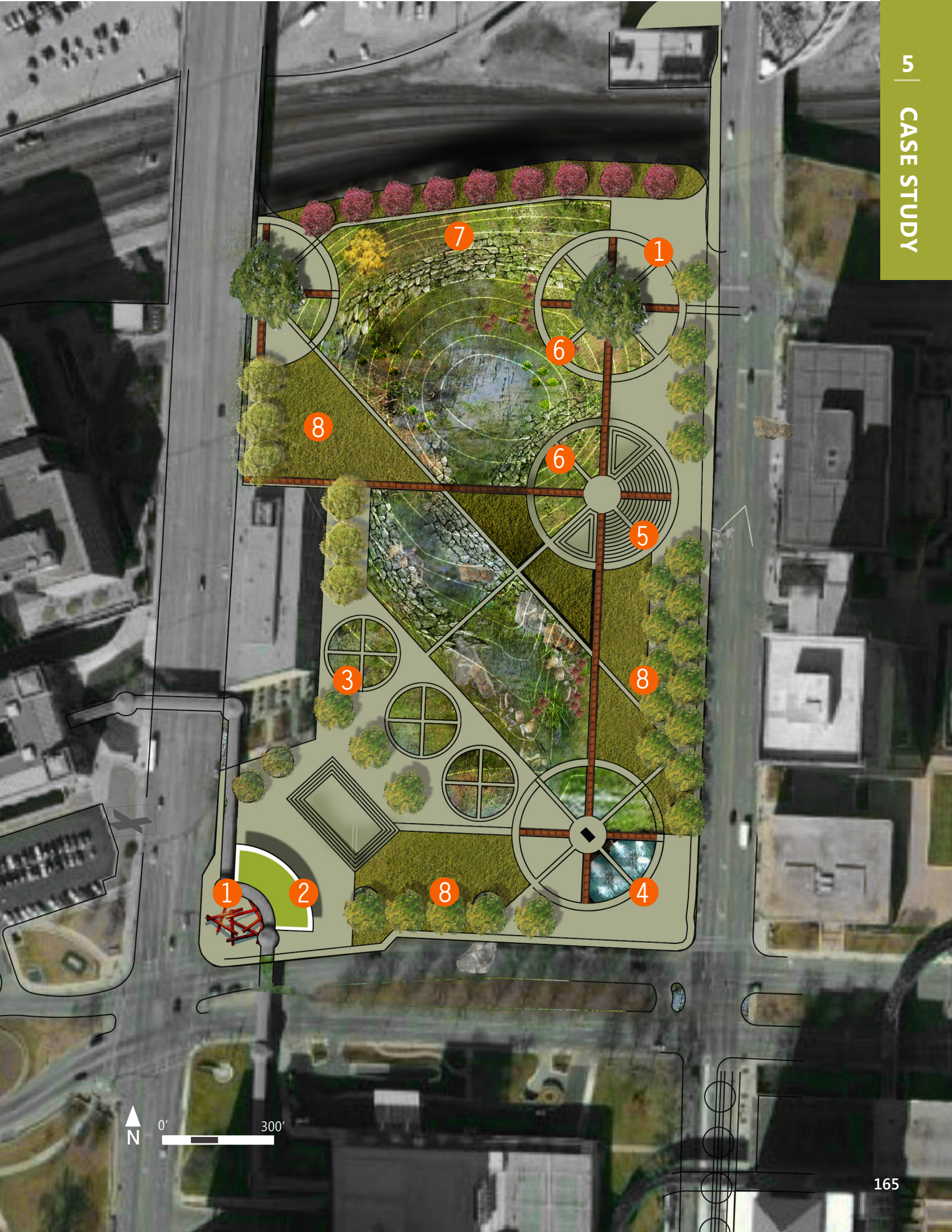

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FIGURE 5.45: Design Strategies 1 and 2 Context Key (Author 2014)

1 Repurposed Water Pipe Art

Art made from water infrastructure artifacts are incorporated throughout the development to foster mindfulness and point out the juxtaposition between gray infrastructure systems and green infrastructure systems. A large water artifact art piece/water feature will be placed at the North West entrance into Washington Square Park. This entrance is identified as a major entry into downtown Kansas City by KCDC. It is important to use this corner to make a statement about the new identity of Washington Square Park.

I. HYDROLOGIC FUNCTION

Mimic and Work with Nature

- Provide Habitat
- Balance Viable Biota
- Reclaim and reuse water to create closed water resource cycles

FIGURE 5.46: Fulfilled Motivational Model for Design Strategies 1 and 2 (Author 2014)

2 Cafe / Roof Top Garden

A two story structure is proposed for the Northwest entrance of the park. The bottom floor houses an information center for Washington Square Park. On the second flood is a cafe with a roof garden. Both uses draw in users of the bus, metro, or rail line, in hopes that they will either want information about where they have just arrived, or a coffee before they leave. The businesses will also be directly accessible by the skywalk. From the sky walks people have direct views of the park and direct access to the cafe's rooftop garden.

II. PHYSICAL AMENITY

Expose Functions

- Create Overlooks with Views of the water system
- Place water systems in social hubs or make the water system a destination
- Provide paths to the water system that connects to existing trails
- Provide clear points of entry into the water system

Foster Mindfulness

- Provide informational signage and exhibits
- Create a narrative of the water system
- Make stormwater related artifacts integral to the design
- Engage thinking with something surprising

Create opportunities for competence, skills, and knowledge

- Provide Opportunities for people to demonstrate sustainable water practices
- Nurture networks that spread and support sustainable water practices
- Communicate effective action
- Invite educational games or activities

III. SOCIAL VALUE

Community Values

- Education
- Quality of Life for Children and Families
- Property Value

Community Goals

- Implement Green Stormwater Management Strategies
- Provide Public Art to Express Local Identity and History
- Washington Square Park as a Gathering Hub
- KC as an Emerging "Green City"
- Aesthetic Community Benefit
- Minimize Waste and Increase Efficiencies
- Provide provisions for urban agriculture

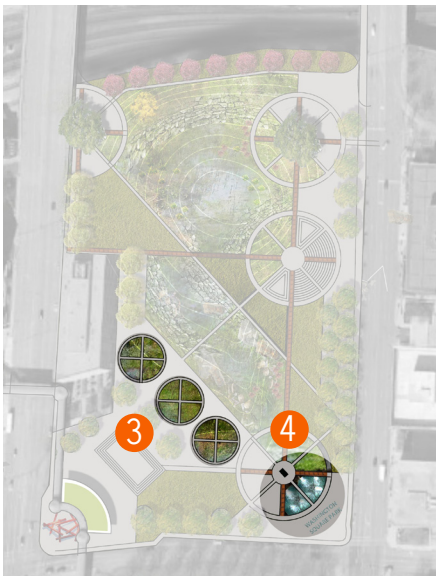

FIGURE 5.47: Design Strategies 3 and 4 Context Key (Author 2014)

3 Test Pools

Test pools that look like miniature treatment tanks are used by the City, organizations with sustainable initiatives, and other members of the community to test different "green" water management strategies and materials. These spaces allow the City to learn more about green infrastructure performance, and to quantify explorations in a controlled setting. Groups can use these pools to test the

I. HYDROLOGIC FUNCTION

Mimic and Work with Nature

- Minimize subsurface drainage
- Integrate grey and green infrastructure
- Reclaim and reuse water to create closed water resource cycles

FIGURE 5.48: Fulfilled Motivational Model for Design Strategies 3 and 4 (Author 2014)

4 Entry Fountain

efficacy of various aquatic plants, compare different soils and aggregates, as well as test different gray or green stormwater management technologies in a "safe-to-fail" environment. This space also provides social proof to users that others in the community are taking interest and action towards a new way of thinking about and managing water.

The George Washington Memorial Statue is at the center of the North East treatment tank. In the treatment pods in front of the statue are shooting fountains, fed by treated wetland water. Incorporating water with the statute's experiential aesthetic allows visitors to recognize that while this is still Washington Square Park, it has taken on a new water-centric identity and function. This space communicates the combination of the desired civic aspect of the park with the needed water-based functions.

II. PHYSICAL AMENITY

Expose Functions

- Bring water to the surface
- Create systems that visibly collect and store water and pollution
- Place water systems in social hubs or make the water system a destination
- Provide clear points of entry into the water system

Foster Mindfulness

- Engage thinking with something surprising

Create opportunities for competence, skills, and knowledge

- Nurture networks that spread and support sustainable water practices

III. SOCIAL VALUE

Community Values

Protecting Water Quality of Water Bodies
Quality of Life for Children and Families
Property Value

Community Goals

- Implement Green Stormwater Management Strategies
- Provide Public Art to Express Local Identity and History
- KC as an Emerging "Green City"
- Aesthetic Community Benefit
- Address Combined Sewer System Overflows
- Use the Public Realm as a Marketing Tool for Environmental Stewardship
- Provide areas for recreation

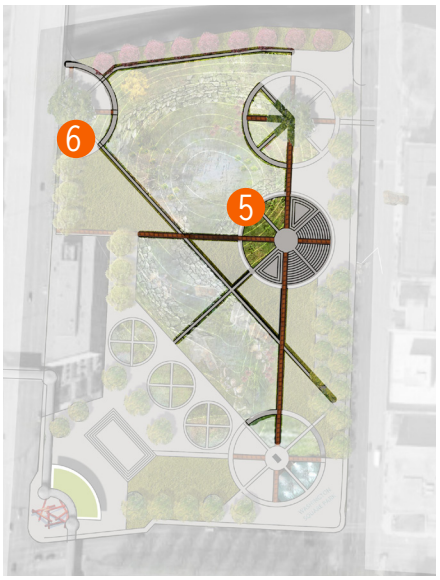

FIGURE 5.49: Design Strategies 5 and 6 Context Key (Author 2014)

5 Amphitheater

The amphitheater is directly accessible from the sidewalk and provides an ADA accessible ramp down to the wetland. This space is oriented toward the grand view of the city, which serves as the backdrop to concerts and events. Everyday use of the space includes exercising, seating, and relaxing before catching the bus.

As visitors descend down the amphitheater steps they get closer to the wetlands. During rain events these lower paths are closed while the amphitheater is inundated with water.

FIGURE 5.50: Water Treatment Plant[s] Perspective (Author 2014)

6 Lookout Paths

Paths were strategically placed to have aesthetic views and access to the hydrologic functions. Many paths are raised to stay at the height of the surrounding streets to keep them accessible to all during wet weather events. The main paths transecting the site connect to public transit stops and provide convenient routes for crossing through the park to the other side of the street.

I. HYDROLOGIC FUNCTION

II. SOCIAL AMENITY

Expose Functions

- Create overlooks with views of the water system
- Place water systems in social hubs or make the water system a destination
- Provide paths to the water system that connects to existing trails
- Provide clear points of entry into the water system
- Provide seating with views of the water system

III. PERSONAL RELEVANCE

Community Values

- Quality of life for children and families
- Air quality
- Property value

Community Goals

- Washington Square Park as a gathering hub
- Walkable downtown
- Aesthetic community Benefit
- Use the Public Realm as a Marketing Tool for Environmental Stewardship

FIGURE 5.51: Fulfilled Motivational Model for Design Strategies 5 and 6 (Author 2014)

FIGURE 5.52: Design Strategies 7 & 8 Context Key (Author 2014)

I. HYDROLOGIC FUNCTION

Mimic and Work with Nature

- Balance viable biota
- Reduce erosion
- Minimize subsurface drainage

FIGURE 5.53: Fulfilled Motivational Model for Design Strategies 7 and 8 (Author 2014)

7 Terraced Rock Seating

Terraced steps line the wetland and "Turkey Creek Branch." These steps are made from concrete repurposed from the KC Rail Car construction site just west of the park. The steps serve as seating for pedestrians, allowing access to the water's edge and a place to view the wetland and day lit creek. The edge treatment also prevent erosion, stabilizing the creek banks.

8 Meadow Lawns

Not all spaces need to be highly naturalistic to provide ecological function. To provide clean lines to the design, mown lawns of native turf grasses are incorporated. These lawns provide space for people to recreate, bring their dogs, or sit for a picnic. The lawns demonstrate how ecological functions can look manicured, while signage informs users how little water, hence financial resources, the lawn requires.

II. SOCIAL AMENITY

Expose Functions

- Provide seating with views of the water system

III. PERSONAL RELEVANCE

Community Values

- Quality of life for children and families

Community Goals

- Aesthetic community Benefit

Section 5.5: Reflection

5.5.1: Reflection Criteria from Framework

Throughout the design process many iterations of reflection were conducted to ensure all aspects of the NUWM paradigm were fulfilled. Once all principles were sufficiently fulfilled through the design, the design process ended. Figure 3.51 illustrates what design strategies address each principle.

How the Proposed Design Fulfills the NUWM Principles

MULTI-BENEFIT SOLUTIONS

Social

- Gathering space for the community
- Recreational amenity
- Aesthetic benefits
- Assists in a more walkable neighborhood by increasing shade and decreasing perceived walking distance
- Decreases CO2 emissions and heat island effect
- Increases air and water quality

Ecological

- Provides habitat
- Increases diverse biota
- Reduces stormwater pollution
- Promotes ground water recharge

Economic

- Collects water for reuse in water features and buildings
- Eliminates the need to install the $2.5 million dollar dropshaft and pipe plan
- Will save money on replacing more hard infrastructure in the future
- Creates green jobs in downtown Kansas City

CONSIDER CONTEXT AT MULTIPLE SCALES

- Considered hydrological context of the entire watershed down to the specific site conditions
- Considered the social affects on and from the entire downtown community
- Considered surrounding development potential of the immediate area
- Considered the final design's influence on the future developments in Kansas City

RECOGNIZE TRUE ECONOMIC COSTS SOCIAL AND BENEFITS

- Develop for long term costs
- Provides immediate and long term social benefits
- Provides a design that costs less than the Black & Veatch Plan while providing more social and ecological benefits

MIMIC AND WORK WITH NATURE

- Integrates gray and green infrastructure elements
- Creates a system of decentralized water management elements
- *See ecological benefits under "Multi-Benefit Solutions"

DISTRIBUTED RESOURCE MANAGEMENT SYSTEM

- Provides a connected water infrastructure system of green and gray stormwater management elements
- Provides a variety of types and scales of stormwater management elements

RESOURCE EFFICIENCY, RECOVERY AND RECYCLING

- Collects and reuses water for other site functions such as flushing toilets and water features
- Uses repurposed water pipes as art installations from projects going on in Kansas City that are replacing the old water conveyance pipes
- Repurposes the concrete that the City is pulling out in order to install the KC Rail Car

INTEGRATE WITH ALL ASPECTS OF COMMUNITY PLANNING AND DEVELOPMENT

- Repurposes concrete from the Railcar KC demolition as construction materials for the hardscapes
- Provides amenities to workers in the area and users of nearby public transportation hubs
- Achieves objectives of the "Making Grand 'Grand'" City plan by implementing streetscapes along Grand Street through Crown Center
- Provides an urban tree nursery for Kansas City to use as they continue to implement the "Making Grand 'Grand'" City plan
- Provides a viable alternative to Black & Veatch's Turkey Creek OCP that is less costly
- Addresses CSO issues in a multi-beneficial way that promotes environmental stewardship
- Creates an aesthetic public destination for downtown Kansas City

SHARE THE RESPONSIBILITY AND RISK THROUGHOUT THE COMMUNITY

*It was found that to share responsibility and risk throughout the community beyond building intellectual infrastructure (see below) requires strategies beyond the scope of landscape architecture, such as creating new City ordinances and incentive programs.

BUILD INTELLECTUAL INFRASTRUCTURE

- Creates an environment where sustainable practices are the social default
- Educates the community about local issues and sustainable solutions through signage and exhibits
- Fosters mindfulness in the community about the importance of hydrological functions by bringing them to the surface and revealing their value to the community
- Creates opportunities for people to gain knowledge about green infrastructure, as well as space for the community to test various strategies in a safe-to-fail environment

ADAPT AND EVOLVE

- Uses environmental psychology strategies to motivate the community to support the NUWM paradigm and approach in future developments
- Is a safe-to-fail system comprised of decentralized elements. This makes the system easy to adapt and maintain over time
- Provides an urban tree nursery to support streetscaping down Grand Street and other downtown corridors
- Provides the City with the option to install the dropshaft and pipe solution as a back up to the proposed integrated gray and green water infrastructure system
- Supports the City's vision to cap the RR lines by connecting the park's grade to that of the bridges passing over the RR lines

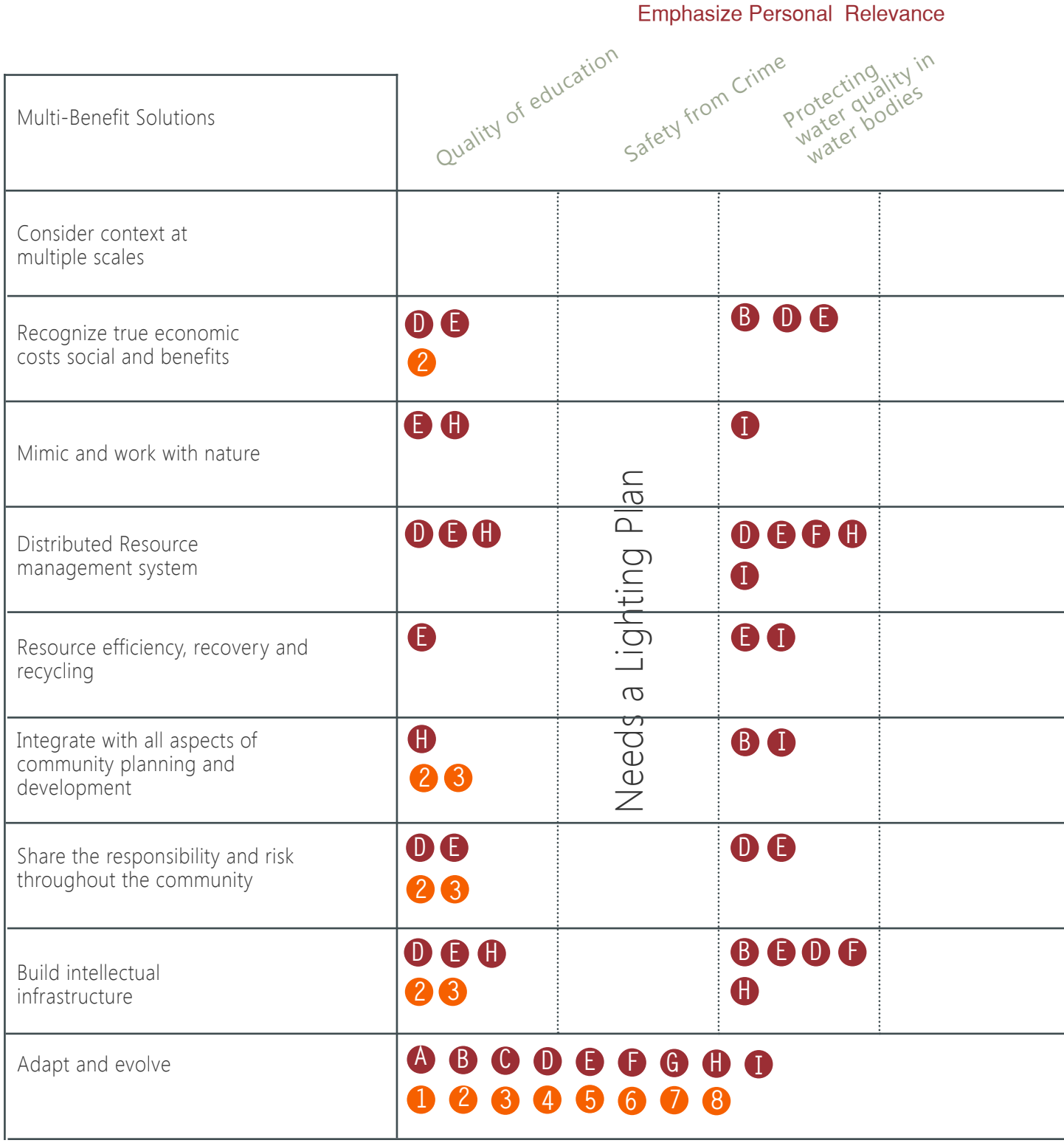

FIGURE 5.54: Final Design Reflection (Author 2014)

5.5.2: Reflection on General Design

Quality of life for children and families	Protect Air Quality	Increase Property Values
B D E 2		A B C D E 2
E I	B F	A E
B D E F		B D E
E I 8		E 1
B I 2		B 1 2 4
D E 2		D E 2
B D E 2		B C D E 1 2

Upon reflection the design is found to possess many strengths in fulfilling the NUWM paradigm, as well as a few weaknesses. Strengths of the design include creating a cohesive district identity of sustainability. Connecting Washing ton Square Park to Crown Center programmatically, physically, and conceptually is important to the social impact of the park. While the design for Washington square Park incorporates a variety of activities and destinations, drawing people in from Crown Center will be key to the park's initial social activation. Bringing the historical hydrological functions of the area through the design provides social, ecologic, and economic benefits of all kinds. Day lighting these functions will aid in the community adopting a new mind set towards stormwater. Finally, the design's ability to evolve over time, and to support future community plans and goals makes it a strong solutions for the City.

Chapter 6
CONCLUSION

Project Summary

In this report, I define the New Urban Water Management (NUWM) paradigm, and provide a methodology for catalyzing the adoption of the paradigm through landscape architecture. NUWM is an approach to water-centric development. The overarching goal of the approach is to be ecologically sound and desired the public. NUWM addresses the current gap in literature over suggested water management paradigms. Current literatuer does not provide objectives for the paradigm to be promoted through physical development - it lacks the motivational performance that will push the paradigm into adoption by the community. Environmental psychology fills this gap within NUWM, offering strategies for connecting ecological functions to social values. These two bodies of knowledge form the basic principles and objectives of NUWM, expressed in this project through a Framework (Chapter 3). However, upon applying this Framework in an urban design competition, it was concluded that the Framework does not effectively translate into the design process.

In response to this finding, the Framework was translated into a Design Approach. The Design approach better aids designers in creating spaces that embody and promote the NUWM paradigm by sepatating the contents of the Framework into three iterative steps, Site Analysis, Design Development, and Reflection. Within each step are tools for translating the Framework into a specific site design that motivates communities to value the ecological functions of the design as they pertain to current social values. This involves extracting community goals and values and using them to guide how the design is perceived by the public. It is concluded that in order for a design to embody and promote the NUWM paradigm, the design

elements must possess three variables: 1. Hydrological Function 2. Social amenity 3. Personally Relevance. This design model (Motivation Model) creates design strategies that are ecologically sound and desired and acceptable by the public.

Personal Relevance variables are community goals, values, and issues. Methods for extracting these goals and values are demonstrated in the Washington Square Park Case Study, where the Design Approach is applied. After multiple iterations of adjusting the design, Framework and Motivation Model, the Design Approach evolved into a useful design tool for designers to embody and promote a NUWM within the scope of landscape architecture.

Key Findings From Literature Over The Nature of the New Water Paradigm

- As traditional water conveyance infrastructure is coming to the end of its life in Wester America, the time is right and the need is there for a change in the way cities develop with water
- While varying in emphasis, the reviewed theories and sources provide similar principles and objectives for a new approach to water management in cities. That is, that the new approach to water management should be ecologically sound and desired by the public.
- To be ecologically sound and desired by the public, the approach must be holistic in how it addresses development needs, considering and integrating in community goals and values. Landscape Architects can achieve these two objectives through motivational water-centric design.
- Green infrastructure strategies that are designed as social amenities provide a solid base in providing social, ecological, economic and motivational benefits.

NUWM Paradigm Considerations

While the NUWM Framework is not the definite paradigm for the future of water management, this study can serve as a starting point. The study also provides others with a methodology for taking any principles and transforming them into the design process. In this way, the NUWM paradigm framework can continually be altered with ease as new findings emerge.

NUWM Design Approach Considerations

During the entire Design Approach it is important to understand that the design development area is part of a larger social, ecological, and hydrological system. The focus of this study was on hydrological functions, and while these drove the design decisions, it is important to always keep in mind the larger ecological system. The Design Approach begins to address this through identifying carefully selected social and hydrological boundaries; however, in reality there are no hard boundaries to the forces that effect and are effected by the design, and regional considerations should be taken into account.

Throughout this study adaptability was key. New knowledge was continually being revealed about the nature of the new paradigm, and elements of environmental psychology, and how to properly and clearly convey the relationships between the two during the design process and within the physical design.

Limitations

- The largest limitation of this study and its methodology is that the design's motivational success relies heavily on the method for extracting community goals and values. In this study's case the method for extracting community values were two survey's conducted by the Mid American Regional Council (MARC). While these surveys are respected sources, conducting a survey myself would have given me more insight into what the community's true world views and values are.

- Not being able to do a post-occupancy analysis on the design limits my ability to determine the efficacy of the Framework and Design Approach in motivating change in the community's thoughts and actions regarding water management.

- I thought that using environmental psychology theories to explore how to motivate individuals through spacial means would be more effective. I found the vocabulary within the body of knowledge to be vague and outdated, and surprisingly not easily transferable to the design process. I found it challenging to visually articulate and represent the concepts. This may be due to another limitation, which is my experience and knowledge of psychology. After multiple iterations of designing with the concepts, they began making more sense, and I believe that I was able to grasp what each concept meant and make a good attempt at representing it.

- This leads to the last limitation. That is that I analyzed, responded to, and altered the Framework, Design Approach, and Design based on my own understanding, knowledge, and personal design approach. I believe that another designer may be able to take the Framework and use it as a sufficient design tool, and that another designer may say that the Design Approach method is equally as useless as the Framework was to me. Until this approach is tested by others in the field, it is hard to tell whether my findings are useful for the profession, or just for my own benefit in designing motivational water management systems.

Future Research

Theoretical

I think that evaluating and comparing other psychology-based theories to motivating communities through design would be beneficial before delving further into environmental psychology in relation to this study. Newer concepts such as social and experiential learning may offer interesting insight. On the other end, I also found potential in marketing strategies for providing insight into behavioral psychology.

In addition, a better understanding of the nature of social and cultural movements and paradigm shifts is essential to catalyze change and promote the implementation of a shift toward a new paradigm of water management. A better understanding of the nature of paradigm shifts would allow designers to get to the core of the objective, perhaps developing their own psychological theories. Towards the end I started finding more material on how society shifts from one paradigm to another, and I think that a deeper understanding of that would have been helpful in shaping how the paradigm was translated into design strategies.

Practical

Post-occupancy analysis in the form of follow-up surveys would allow designers to understand what aspects of the design is motivating a shift in mind sets and practices regarding water management.

The issues regarding water are continuously evolving with the needs and mind sets of humans. Therefore, the understanding of how mindsets effect the evolutionary process of water management should be continuously explored.

Conclusion

Designers have many viable approaches to promoting new paradigms of sustainability. They can choose to educate visitors about the functions in hopes that it will change their world view, or in the case of this project, they can attempt to reframe or reveal to users how the design aligns with their currently held values.

If designers can motivate users to prefer the new paradigm approach in their daily and civic decision making, we can start shifting our cities into the new paradigm of water-centric developments that value water resources, using them for multi-beneficial purposes, and reconnecting people to water systems.

APPENDICES

Appendix A: Glossary

BYSTANDER CONFUSION: a tendency for people in a crowd to not get involved as a response to other people not responding (Manning 2013)

COMBINED SEWER SYSTEM (CSS): combined sewers are designed to collect rainwater, sewage and industrial wastewater in the same pipe. During storms these can overflow overwhelming water treatment plants and resulting in the discharge of the mixture into nearby streams and rivers City of Kansas City 2009)

COMBINED SYSTEM OVERFLOW (CSO): "Combined Sewer Overflow" or "CSO" shall mean a discharge, release and/or overflow from the combined sewer system at a point prior to the headworks of a WWTP. (City of Kansas City 2009)

ENVIRONMENTAL PSYCHOLOGY: "Environmental psychology is a field of study that examines the interrelationship between environments and human affect, cognition and behavior" (Bechtel & Churchman 2002, 12).

ENVIRONMENTAL STEWARDSHIP: the responsibility for environmental quality shared by all those whose actions affect the environment. (EPA 2013)

GREEN INFRASTRUCTURE: spatially and functionally integrated systems and networks of protected landscapes supported with protected, artificial and hybrid infrastructures of built landscapes that provide multiple, complementary ecosystem and landscape functions to a public, in support of sustainability (Ahern 2007)

INFRASTRUCTURE: Basic physical and organizational structures needed for the operation of a community or the services and facilities needed for the community to function (Ternieden 2010)

OBJECTIVE: specific result that a system aims to achieve; serves as the basis for evaluating performance

MANAGEMENT PARADIGM: refers to a set of basic assumptions about the nature of the system to be managed, the goals of managing the system and the ways in which these goals can be achieved. The paradigm is manifested in artifacts such as technical infrastructure, planning approaches, regulations, engineering practices, models, etc. (Pahl-Wostl 2010).

PARADIGM: an agreed way of thinking about the world and an agreed set of valid approaches to investigating that world shared by any community (Pahl-Wostl 2010).

PRINCIPLE: A fundamental quality or attribute determining the nature of something

SUSTAINABLE DEVELOPMENT: Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. All definitions of sustainable development require that we see the world as a system—a system that connects space; and a system that connects time (Ahern 2010)

SUSTAINABLE STORMWATER MANAGEMENT: an approach which shifts the emphasis on stormwater management from the heavily engineered "collect and convey" approach to one which relies on natural solutions to storage and treatment (Pahl-Wostl 2010)

SYSTEM: structured relationships defining the flows of information, energy, and material (Bachman, 2003 p. 17)

STRATEGY: a plan, method, or series of maneuvers for obtaining a specific goal or result

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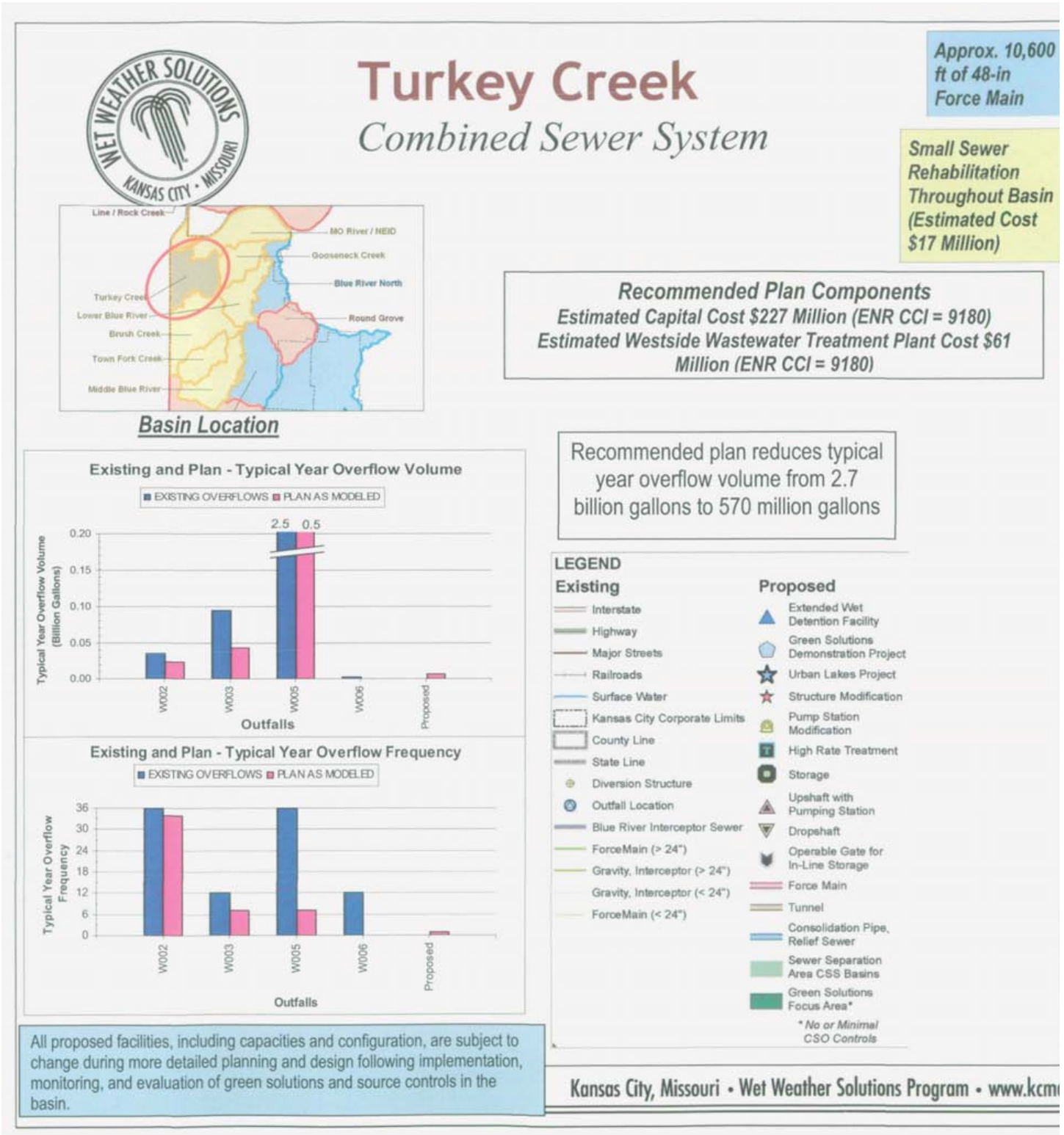
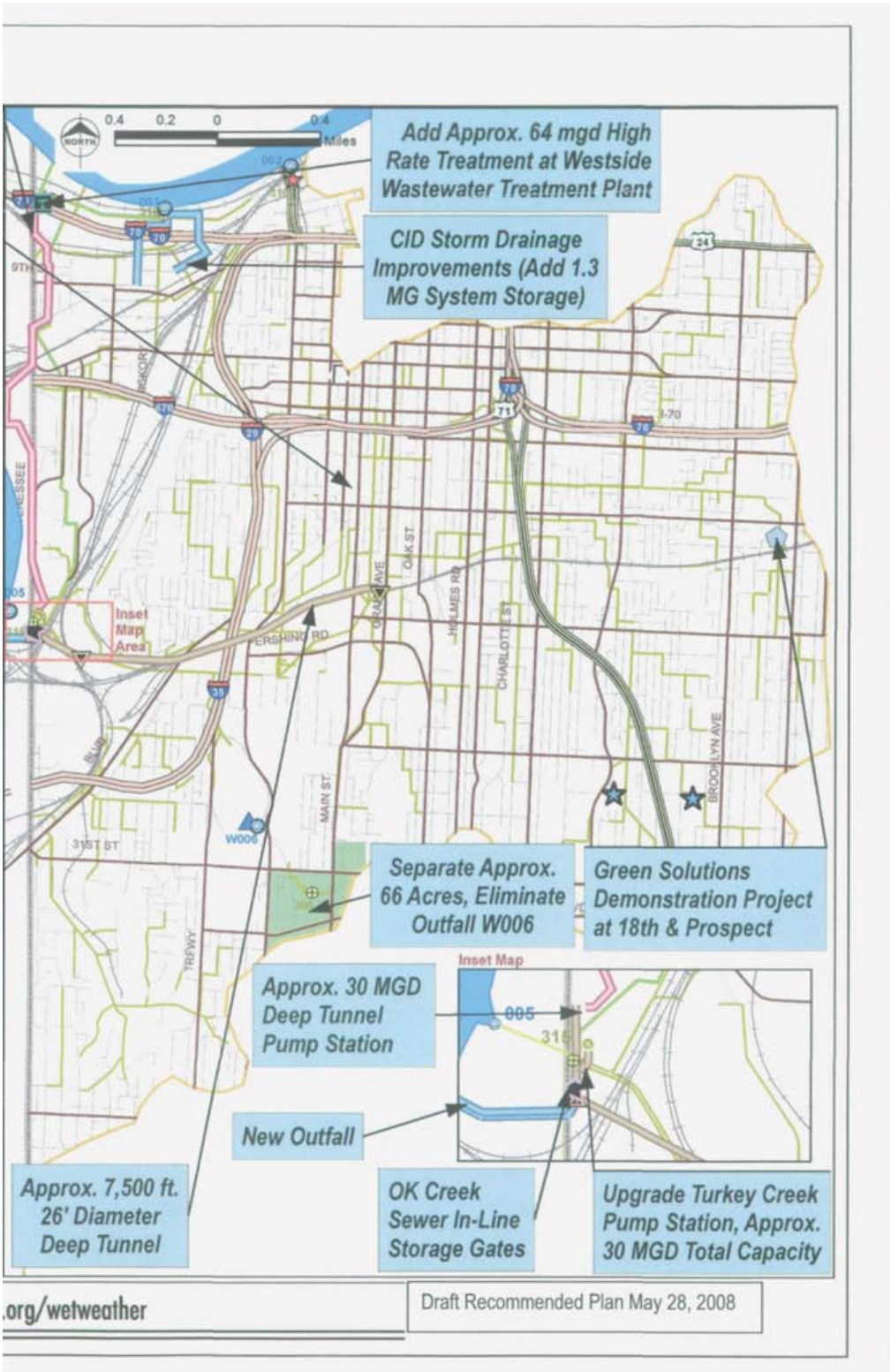
Appendix C: Turkey Creek Overflow OCP

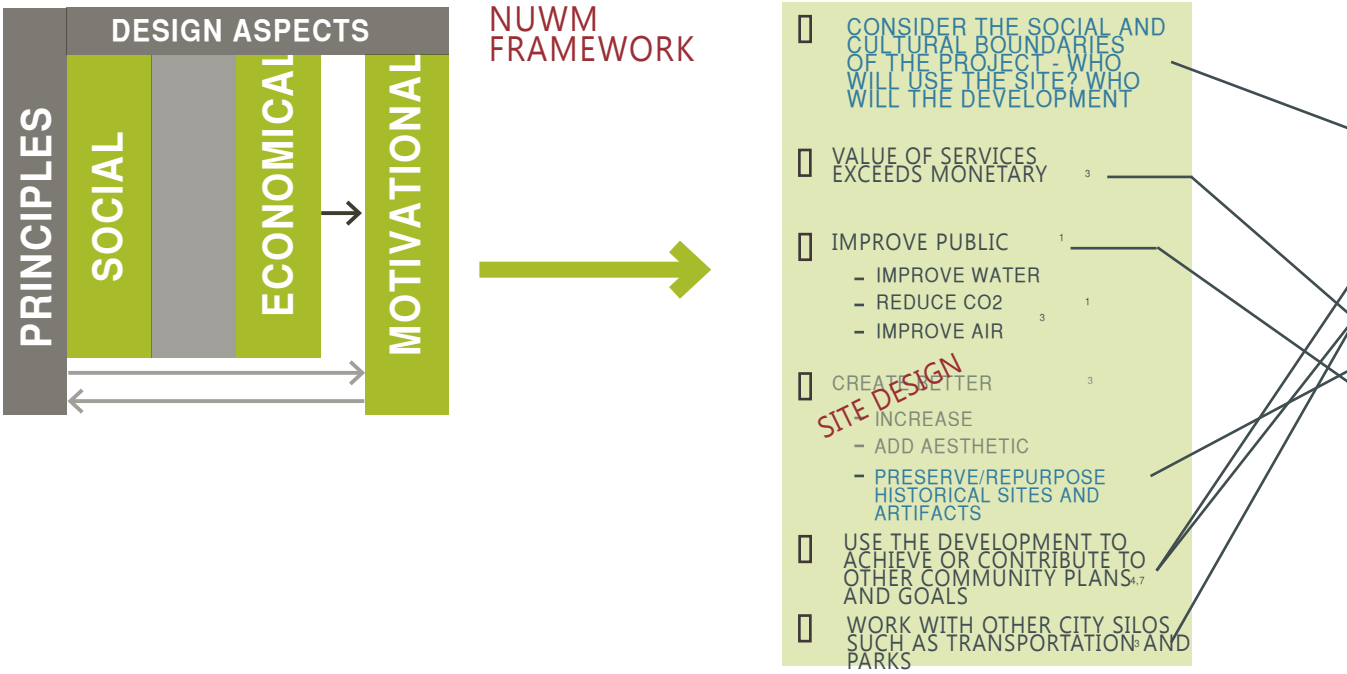
(Black & Veatch 2008)




Add Approx. 64 mgd High Rate Treatment at Westside Wastewater Treatment Plant
CID Storm Drainage Improvements (Add 1.3 MG System Storage)
Inset Map Area
Separate Approx. 66 Acres, Eliminate Outfall W006
Green Solutions Demonstration Project at 18th & Prospect
Inset Map
Approx. 30 MGD Deep Tunnel Pump Station
New Outfall
Approx. 7,500 ft. 26' Diameter Deep Tunnel
OK Creek Sewer In-Line Storage Gates
Upgrade Turkey Creek Pump Station, Approx. 30 MGD Total Capacity
.org/wetweather
Draft Recommended Plan May 28, 2008

Appendix D: Methodology for Social Considerations Research Agenda

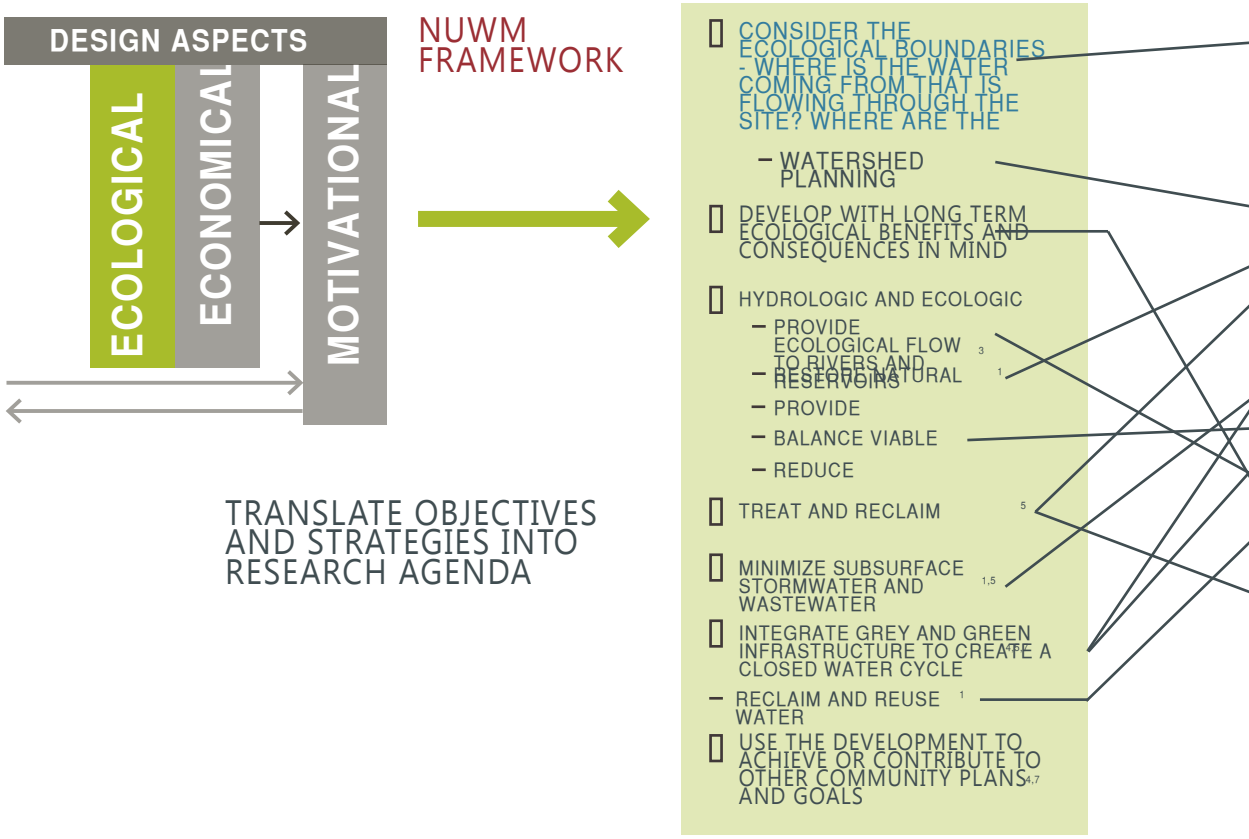
(Author 2014)

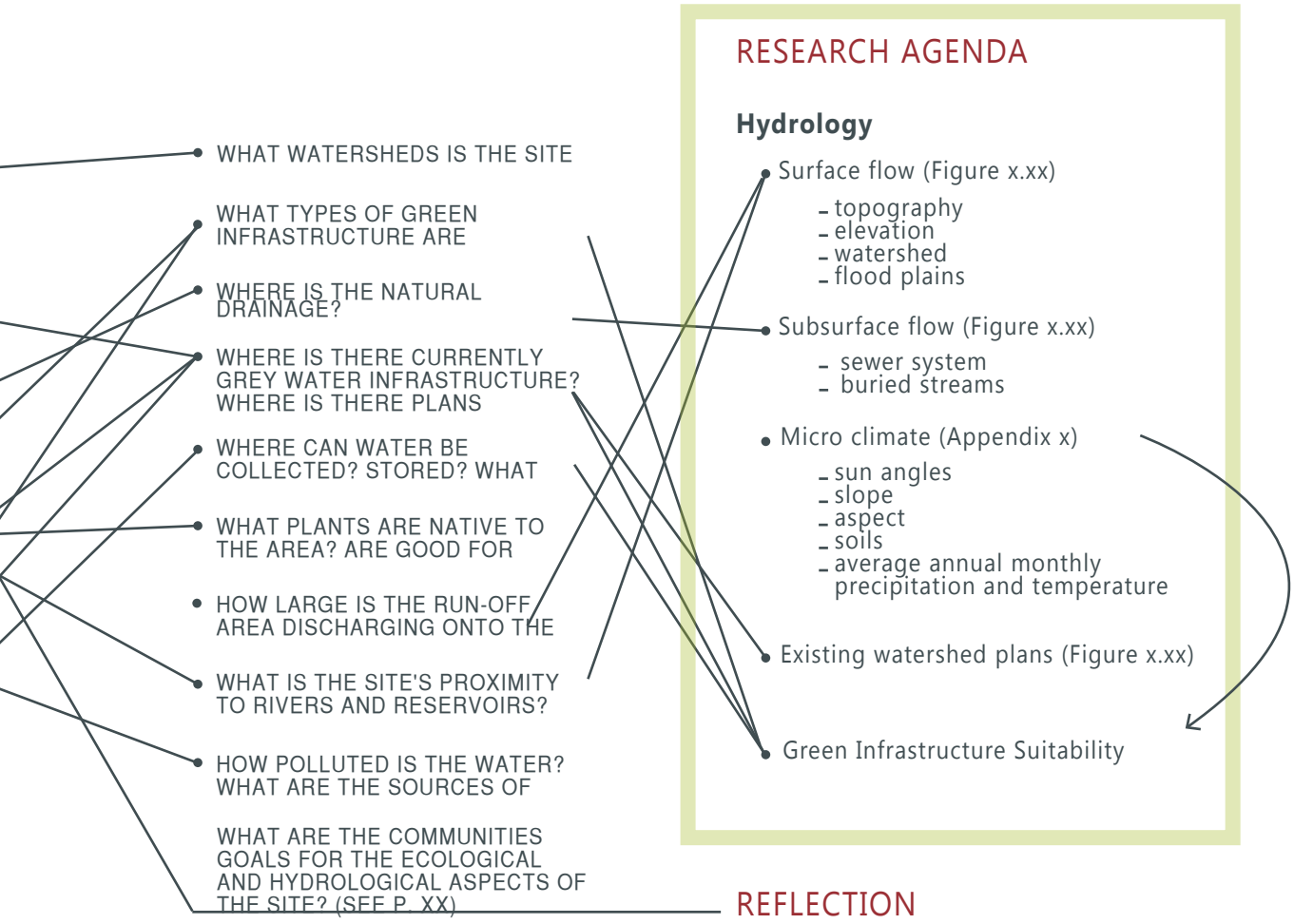



WHAT CITY PLANS WILL HAVE AN INFLUENCE ON THE SITE? WHAT
WHAT ARE THE VALUES OF THE COMMUNITY AND
WHO IS USING THIS SITE? WHERE ARE THEY GOING? WHAT ARE THEY
WHAT ARE THE HISTORICAL SITES AND ARTIFACTS IN THE AREA THAT NEED TO BE PRESERVED OR
RESEARCH AGENDA
Community Goals (See Background Part 3)
• Review community plans (See Backgroound Part 3)
- Goals and Objectives
Physical plans (Figure x.xx)
Review community surveys (Appendix x)
- Community Values (Figurex.xx)
Historical Background
Basic History
Cultural History
Social and Cultural Nodes
• Destinations
- note target audience
Green Infrastructure Suitability
REFLECTION

Appendix E: Methodology for Water Considerations Research Agenda

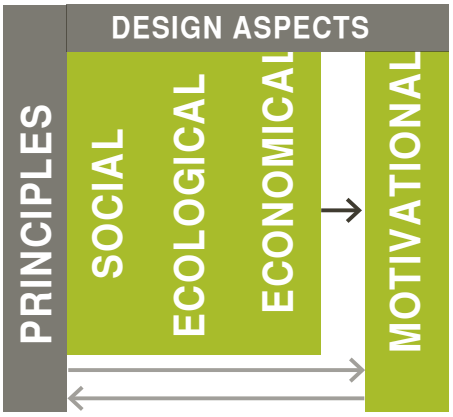
(Author 2014)




WHAT WATERSHEDS IS THE SITE
WHAT TYPES OF GREEN INFRASTRUCTURE ARE
WHERE IS THE NATURAL DRAINAGE?
WHERE IS THERE CURRENTLY GREY WATER INFRASTRUCTURE? WHERE IS THERE PLANS
WHERE CAN WATER BE COLLECTED? STORED? WHAT
WHAT PLANTS ARE NATIVE TO THE AREA? ARE GOOD FOR
HOW LARGE IS THE RUN-OFF AREA DISCHARGING ONTO THE
WHAT IS THE SITE'S PROXIMITY TO RIVERS AND RESERVOIRS?
HOW POLLUTED IS THE WATER? WHAT ARE THE SOURCES OF
WHAT ARE THE COMMUNITIES GOALS FOR THE ECOLOGICAL AND HYDROLOGICAL ASPECTS OF THE SITE? (SEE P. XX)
RESEARCH AGENDA
Hydrology
Surface flow (Figure x.xx)
- topography
- elevation
- watershed
- flood plains
Subsurface flow (Figure x.xx)
- sewer system
- buried streams
Micro climate (Appendix x)
- sun angles
- slope
- aspect
- soils
- average annual monthly precipitation and temperature
Existing watershed plans (Figure x.xx)
Green Infrastructure Suitability
REFLECTION

Appendix F: Methodology for Potential Development Research Agenda

(Author 2014)



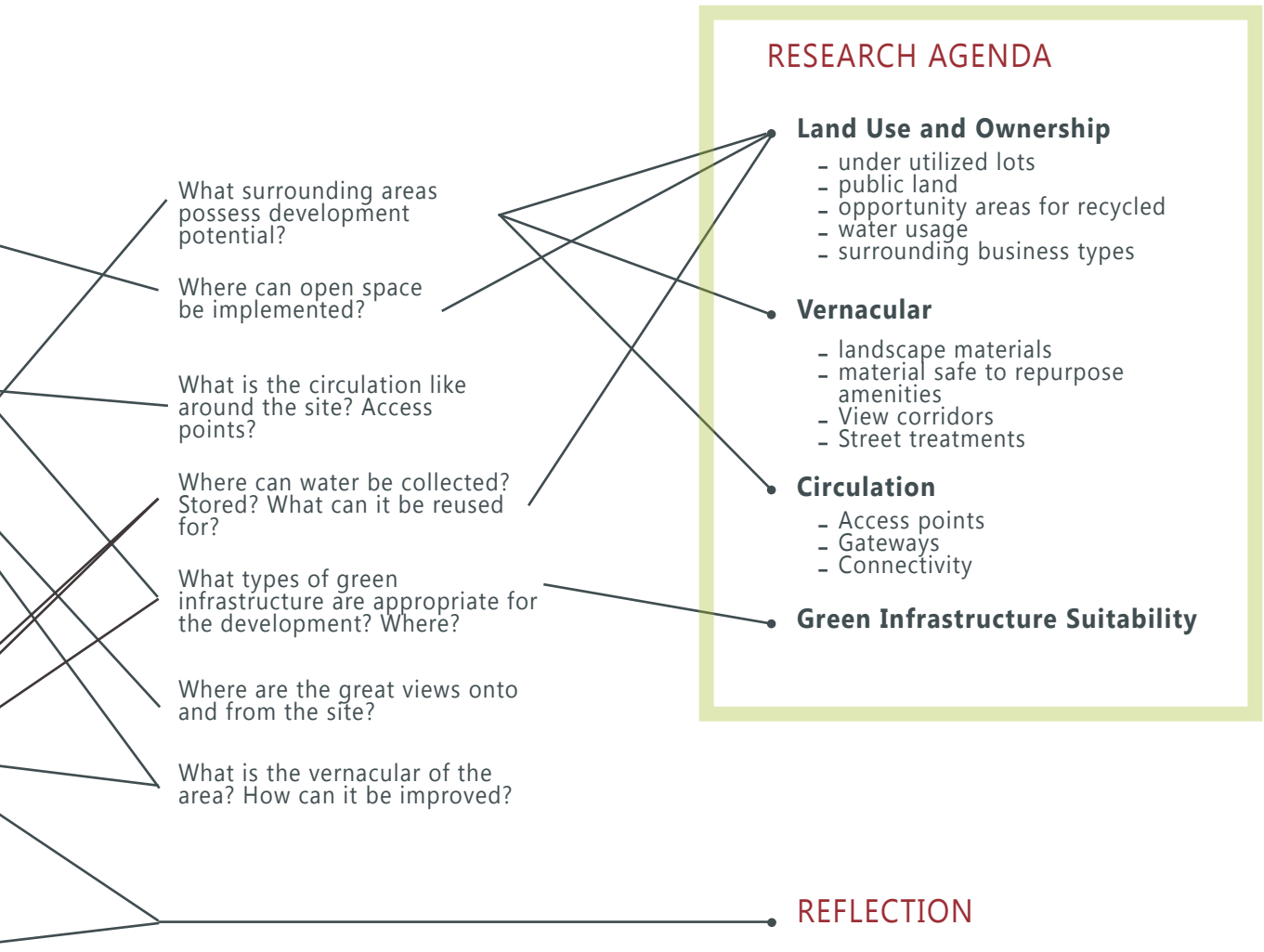
NUWM FRAMEWORK

SOCIAL

- Improve public health
  - Improve water quality
  - Reduce CO2 emissions
  - Improve air quality
  - Increase opportunities for recreation
- Create better neighborhoods
  - Increase walkability
  - Add aesthetic value

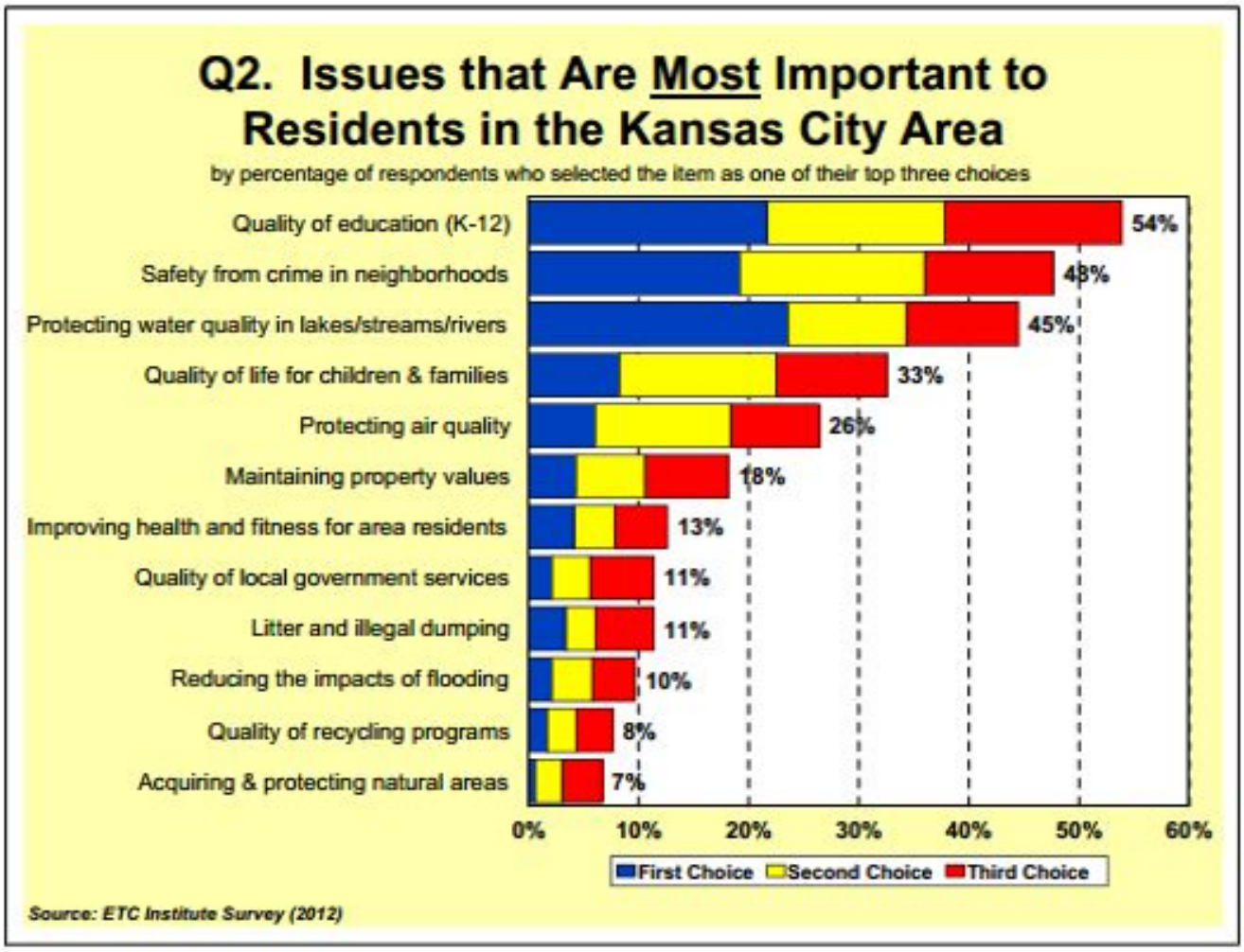
ECONOMIC

- Consider the political boundaries, who is paying for this development? Where can public/private partnerships be made?
- Develop with a long term financial view
- Increase property values
- Increase resilience through multiple lines of defense again flooding and contaminates
- Reclaim and reuse water
- Close resource loops on-site

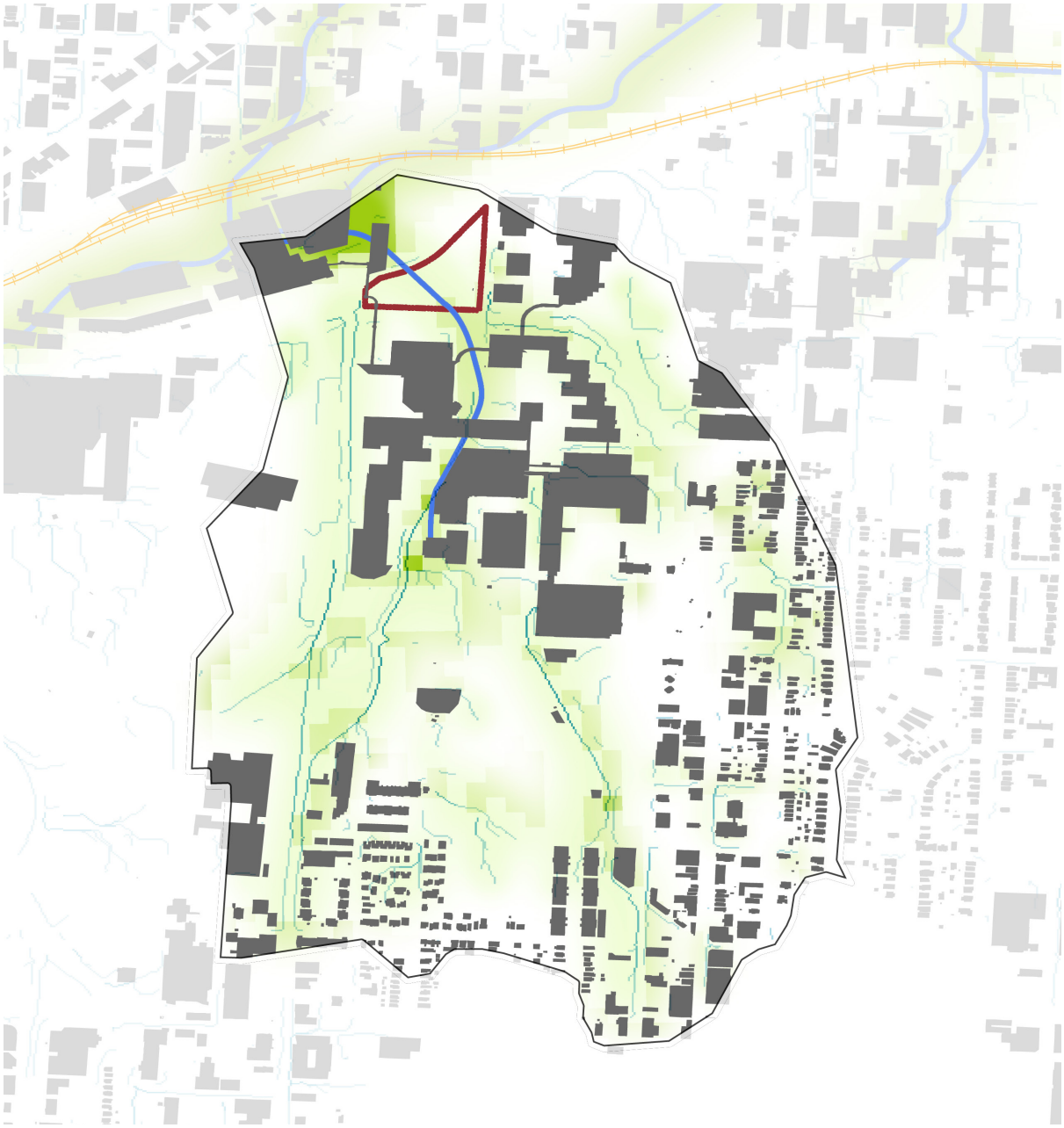

What surrounding areas possess development potential?
Where can open space be implemented?
What is the circulation like around the site? Access points?
Where can water be collected? Stored? What can it be reused for?
What types of green infrastructure are appropriate for the development? Where?
Where are the great views onto and from the site?
What is the vernacular of the area? How can it be improved?
RESEARCH AGENDA
Land Use and Ownership
- under utilized lots
- public land
- opportunity areas for recycled
- water usage
- surrounding business types
Vernacular
- landscape materials
- material safe to repurpose amenities
- View corridors
- Street treatments
Circulation
- Access points
- Gateways
- Connectivity
Green Infrastructure Suitability
REFLECTION

Appendix G: Social Values of the Kansas City

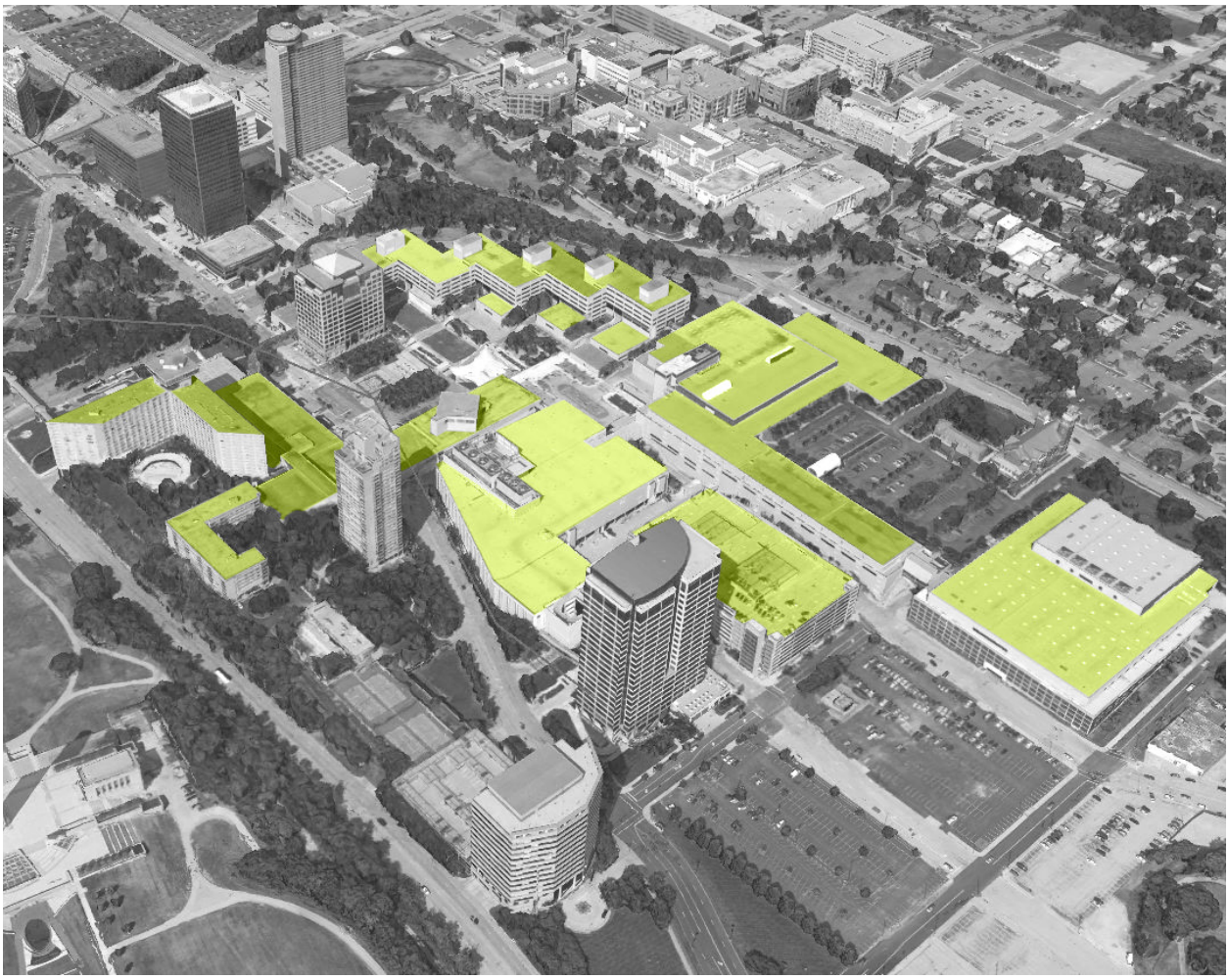
(ETC Institute 2012)



Appendix H: Green Infrastructure Suitability



Suitability Analysis: Wetlands (Author 2014)



Suitability Analysis: Green Roofs (Author 2014)