ABSTRACT

Title of Thesis:	DESIGNING THROUGH THE LENS OF LANDSCAPE URBANISM
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Cities of the 21st century are impacted by uniquely modern phenomena such as sea-level rise, urban flooding, and decentralization. As environmental impacts and urban dynamics change, we are forced to view urban spaces differently than we have in the past.

Landscape Urbanism developed in the early 1990s as a response to this need, turning to the landscape as a foundation for viewing, constructing, and rehabilitating urban spaces. Although Landscape Urbanism theory does provide a platform to determine what sites are ideal for development and how to design with environmental and ecological systems on a site, the abstract nature of the literature of Landscape Urbanism creates challenges in practice.

This thesis combines investigation into Landscape Urbanism theory with research on the methodologies of Sustainable Urbanism, Smart Growth, and Ecological Urbanism to create a framework for the application of

Landscape Urbanism to site design. This framework is then tested in the conceptual redevelopment of a former industrial site in Baltimore, Maryland.

DESIGNING THROUGH THE LENS OF LANDSCAPE URBANISM

by

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Dedication

I dedicate this thesis work to my family. To my loving daughter Mia for keeping my spirits up and lighting up my days. Mia, you push me to be a better person and make me keep my promises and goals.

And my beautiful parents Mario Espinoza and Sonia Alvarez, for their endless support with this thesis and all avenues of life. A special feeling of gratitude to my mother for staying up with me, helping with my daughter, and providing encouraging words along the way.

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Table of Contents

List of Figures

Chapter 1: Introduction

Today, our cities face many challenges caused by heightened natural phenomenon such as sea-level rise impacts, urban flooding, and shrinking cities (Blanco, Alberti, Olshansky, et al., 2009; Gornitz, et al., 2009). Also, we are facing tension and changes in our economic and political climate globally. Each of these challenges impacts the 21st-century city by causing infrastructure problems, abandoned properties, and the migration of additional people (Waldheim, 2006, 2016). These social and environmental issues bring on new conflicts between our built environment and social norms.

Regrettably, many of the problem's cities face today were caused by practitioners planning and designing cities without a complete understanding of the natural and built environment (Waldheim, 2006, 2016). Practitioners, in many cases, forced developments and communities upon unsuitable natural areas leaving future generations with many problems.

Now we must learn from the past and face the massive changes in both the natural and built environment. We need to start viewing cities differently, especially if we want to prevent our current problems from manifesting into more significant issues. As a result, there is a call for a multidisciplinary approach to design our 21st Century Cities. Practitioners in Planning, Landscape Architecture, Architecture, and Engineering come together to analyze the problems in our cities while achieving good city form.

As the dynamics of urban cities and the impacts of our environment change our minds; practitioners look to the past in order to design our future cities, and we are forced to alter our views of urban spaces. For example, in the past, practitioners planned our cities in low lying areas; replaced and dissected neighborhoods with highways and forgot about the people living in these communities (Waldheim, 2006, 2016; Duany, 2013; Thompson, 2012). We placed factories in our city and pushed people out because of the unhealthy living conditions while developing neoliberal urban planning views that resulted in urban sprawl. Unfortunately, urban sprawl produced more environmental impacts and altered how people lived and made them dependent on automobiles. As people move back to cities, we now value how people interact, with the built and natural environment. As policies and our economic market change our lives, we need to adapt to these changes as well as understand how everything is impacted. Most importantly, each planning and design theory era has left us with lessons on how to improve our well-being and overall future.

In the late 20th Century practitioners across disciplines developed Landscape Urbanism. Landscape Urbanism is an urban planning and landscape architecture theory that emerged as a response to the postmodernist failings of New Urbanism and as a shift from comprehensive planning. It emerged from the shortcomings of the traditional cities and the failings of New Urbanism and was viewed as a solution to neoliberal urban planning thinking and architecture (Duany, 2013; Thompson, 2012). These

schools of thought primarily ignored the landscape and overall green infrastructure within the urban environment. However, the landscape urbanist had different views; they proposed that civic design should be organized around the city's landscape. Thus, the landscape itself becomes the lens for which cities are designed. It-becomes the medium and building block to construct urban spaces (Waldheim, 2006, 2016). The landscape urbanists sought to find solutions to urban challenges by interweaving both cultural and ecological systems.

The design principles and the theoretical framework of Landscape Urbanism can still be seen in the contemporary cities of today in projects like Fresh Kills Park on Staten Island, New York, and Gas Works Park, in Seattle, Washington.

Each of these projects restored ecosystems, bolstered human interaction and uncovered the site's natural beauty. These sites were deteriorating because of past choices however designers used engineered ways to restore the site while also paying attention to the ecological context and how people should use the space.

Most Importantly, the literature review and case studies below reveal a limitation within the Landscape Urbanism theoretical framework. The limitation found was that the discourse offers theoretical guidance, however it is difficult to apply directly to site design at various scales. Landscape Urbanism provides design suggestions but never implementations, policy, or guidelines. Therefore, the theory is ideal for regional and master scale plan

but harder for site-specific design such as a neighborhood block or streetscape.

In order to develop a framework for the application of landscape urbanism principles to site design, two primary goals were established. The first was to understand Landscape Urbanism both in theory and in practice. The second was to define a set of design criteria that would translate into application in site design.

The four central questions that guided the investigation were:

1. How can design principles of Landscape Urbanism be balanced harmoniously with each other, while achieving functional landscapes for both social needs and the ecological systems?
2. How can we design through the lens of Landscape Urbanism theory to plan and create cities?
3. What limitations are there?
4. How can we overcome the limitations?

The literature review of Landscape Urbanism theory and practice helped determine design criteria, which aided in both the site selection and the implementation of the design principles for this thesis. The Landscape Urbanism discourse provided three theoretical themes that guided the design process of this thesis project. They provided the thesis project with explicit goals to determine the success of the Landscape Urbanism theory framework.

Chapter 2: Literature Review

This section will cover the Landscape Urbanism theory, the central themes chosen for application of the theory to a site, and the design criteria created from the theoretical framework. The three central themes selected were Drosscapes, Terra Fluxus, and Landscape of Infrastructure. Although these three themes helped develop a framework for practical application, they had limitations when applying to a test site. Therefore, exploring other theories was needed to jump from theory to practice. The supportive theories are the three Rs, Ecological and Sustainable Urbanism.

2.1: Landscape Urbanism Theory

The term “landscape urbanism” was coined by architect and academic theorist Charles Waldheim (Waldheim, 2006). In his books The Landscape Urbanism Reader (2006) and Landscape as Urbanism: A General Theory (2016), Waldheim assembled a collection of essays from top practitioners in the fields of planning, architecture, landscape architecture, and engineering (Waldheim,2006,2016). Waldheim’s work crystallized the essence of the movement, capturing the origins, the contemporary environment, and the aspirations of Landscape Urbanism.

In essence, Landscape Urbanism is an urban planning and landscape architecture theory that advocates the organization of cities through the design of the landscape rather than the design of its buildings. Landscape

urbanists seek to find a balance between social and natural systems. For example, urban design should not only be visually pleasing but should also have functionality within the bigger ecosystem of the city.

Landscape Urbanism introduces indeterminacy as the design process that includes programming spaces with some flexibility to address unknown future conditions. Also, it views the natural landscape and designed urban areas similar to parts of a machine. That should work together and coexist as one gigantic organism (Waldheim, 2006, 20016; Thompson, 2011).

The theory of Landscape Urbanism embraces the ecological processes. It employs ecological terminology, such as shifting populations, succession, dynamic systems, and self-organization for designing both natural and urban spaces (Thompson, 2011). To design urban areas, the framework advocates for the understanding of all dynamic forces that shape a city. Understanding the overall context of a site is important including all the forms that comprise the landscape, such as built elements, natural, and social, are crucial to designing the site (Thompson, 2011). Additionally, the following nine characteristics were found within the Landscape Urbanism discourse to aid in identifying and applying the theory both in academia and practice (Waldheim, 2006).

The nine characteristics of Landscape Urbanism (LU) are:

- Scale Context- the project should be handled across scales
- The landscape is intermixed with architecture and civil engineering

- The landscape is seen as a binding element that connects all components like a machine
- LU projects increase social interactions between ecology and the urban fabric by using the landscape
- The function of a landscape is more important over the beauty of it
- The Landscape Urbanist uncovers and learns all opportunities and potentials in a landscape
- Infrastructure is highlighted
- Projects develop interrelationships between natural and engineered systems
- The Landscape Urbanist brakes boundaries and organizes the city and landscape as one.

2.1.2: Central Themes Chosen to Develop a Practical Application Framework

To develop a framework for site application, three themes were identified from the theoretical discourse. "Drosscapes," termed by Alan Berger, emphasizes the revitalization of waste spaces (Berger, 2006). James Corner's concept of "Terra Fluxus," focuses on designing the landscape across scales of space and time (Waldheim, 2006). "Landscapes of infrastructure,"

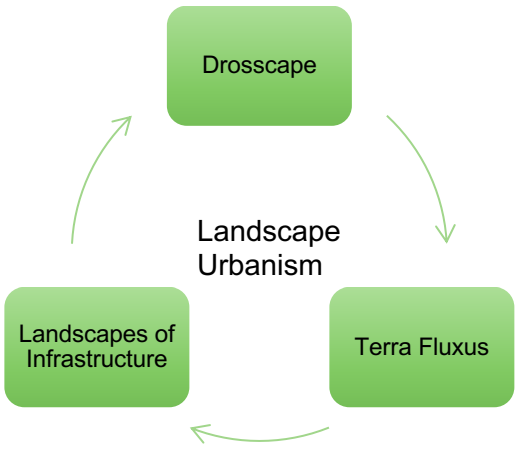

Figure 1: Landscape Urbanism Themes (Espinoza, 2018)

identified by Elisabeth Mossop and Kelly Shannon wherein cultural, ecological, and built infrastructure are interlaced through design (Waldheim, 2006).

2.1.2.1: Drosscapes

Alan M. Berger introduced the concept of Drosscapes to the Landscape Urbanism discourse. Alan M. Berger is an academic and currently teaches at Massachusetts Institute of Technology and is a Professor of Landscape Architecture and Urban Design. Before his time at MIT, Berger was a professor at Harvard-GSD, 2002-2008. Berger has many publications and awards winning books that support his theory such as:

- Reclaiming the American West (2002)
- Drosscape: Wasting Land in Urban America (2006)
- Designing the Reclaimed Landscape (2007)

Berger's primary research focus is to understand the link between humans' consumption of natural resources and the waste and destruction of landscape. To help better understand how to redesign around our wasteful lifestyles that will create more intelligent designs.

Berger emphasizes the importance of remediating the abandoned, toxic, and social pathologies left behind by the industrial era through reclamation, repurposing, and reuse. He argues that the redevelopment of abandoned and leftover spaces in our cities rather than continued green

development is a critical element in reducing ecological problems related to urban environments. "Drosscapes," as Berger defines them, are unused spaces in urban settings that have become neglected and abandoned in the wake of deindustrialization and urban sprawl. These may be industrial sites, remnant road system geometries, buried rivers, and landfills (Berger, 2006; Waldheim, 2006, 2016), or they may be vacant lots, roofs, alleys, parking lots, and sidewalks (Berger, 2006).

Berger argues that our design challenge is to elegantly reincorporate these spaces into the urban fabric into efficient, aesthetically pleasing, and functional spaces. Berger terms this approach, "drossless urbanization." He states that once wasted space is identified, it needs to be reused, resurfaced, and reprogrammed these areas for both humans and ecological services. For example, when a river or stream is daylighted, the designer provides an opportunity for both renewing and promoting social interaction like in the case of Cheonggyecheon, Seoul, or SawMill River in Downtown Yonkers, NY. Both projects are rivers that were daylighted to aid in flooding issues, improve water quality, and provide an economic and social simulation to an area.

2.1.2.2: Terra Fluxus

“Terra Fluxus” is a term coined by James Corner to describe “the shifting processes coursing through and across the urban field (Corner, 2006).”James Corner is the Founder and principal of the landscape architecture and design firm James Corner Field Operations, as well as a

professor of landscape architecture at the University of Pennsylvania's Weitzman School of Design. He is known for projects such as the High Line in Manhattan; a former elevated railway turned linear park, and Freshkills Park on Staten Island, a landfill site, turned into a park. Additionally, Corner also has many publications on landscape architectural design and urbanism that complement both his technique and theoretical methods. Conner books that cover his Terra Fluxus research are:

- Recovering Landscape: Essays in Contemporary Landscape Architecture (1997)
- The Landscape Imagination: The Collected Essays of James Corner 1990—2010

Corner's Terra Fluxus research provides four principles that organize the emerging landscape Urbanist practice and help translate the theory into the practice of the theory.

<u>The Four Terra Fluxus Principles are:</u>

- The ecological and urban process over time designs needs to anticipate future changes and respect the natural process.
- Designing cities horizontally first by understanding the landscape forms and constraints found on a site.
- The operational or working method of the landscape and urban environment should be designed like a machine where all parts work together and simultaneously.

- Imagination plays an important role when re-envisioning the new cityscape.

Corner asserts that designs should start in the landscape by understanding the landforms of the land. Leading to the acknowledgment that the landscape has fluctuations and it is dynamic rather than designing as if the world were flat and unchanging.

Designs start within the “Field,” or the ground planned, and the urban infrastructure connects to the landscape instead of merely placing buildings everywhere. Also, Landscape Urbanist needs to be able to imagine beyond what exists in the present to make connections across scale and time. When designing stationery places, landscapes need to be thought of more broadly and how this one place is part of a more massive environmental machine because the urban environment is interconnected with natural systems and should function together.

Ultimately, there is value in indeterminacy that creates spaces capable of adapting to unknown future conditions. To make this possible, Corner calls for interdisciplinary collaboration within architecture, urban design, landscape architecture, and planning to create a hybrid practice. Lastly, he reflects the overall value nature has in our cities (Corner, 2006; Waldheim, 2006).

2.1.2.3: Landscape of Infrastructure

The theme "Landscapes of Infrastructure" incorporates the ideas of two design theorists who advocate for hybridity between natural and engineered systems (Thompson, 2011). The two theorists are Elisabeth Mossop, a founding director of the design firm Spackman Mossop Michaels and dean of Australia's University of Technology's School of Design, and Kelly Shannon, international practitioner and director of the Graduate Program of Landscape Architecture and Urbanism at the University of Southern California.

Mossop's work explores the various relationships between urban infrastructure and landscape. "If we think of landscape as an infrastructure which underlies other urban systems, rather than equating it with nature or ecology, we have a much more workable conceptual framework for designing urban systems (Mossop, 2006)." Mossop writes, "There should be a relationship between the underlying structures of topography and hydrology and the major structuring elements of urban form, such as the use of catchments as the basis for physical planning and regulation (Mossop, 2006).

Kelly Shannon argues that in order to make the jump from design theory to practice, there is a need to understand all the infrastructure at play, and the infrastructural role the landscape can play. "Landscape is increasingly referenced regarding infrastructure, ecology, urban de-densification, and sprawl, wherein traditional urban design proves costly, slow, and inflexible

(Shannon, 2006)." In Shannon's view, Landscape Urbanism connects layers of infrastructure across different realms. Shannon argues that by stabilizing the ecological realm, using recycled and relic materials, and incorporation of cultural and social pathologies, balanced landscapes can be created. Social and cultural pathologies should be anticipated before they become a problem, social factors are poverty, crime, and old age, that should be anticipated.

Additionally, Shannon states that "Together landscape and infrastructure frame and create new possible sites for urban activities both built and unbuilt projects (Shannon, 2006). Therefore, the Landscapes of Infrastructure theme seeks not only to stop creating problems but create opportunities as well. Recognizing flooding and stormwater must be managed and that they can be managed in a creative way that provides public amenities. This approach also calls for a balance through reuse, referencing history, building complete cycles, both physical and social.

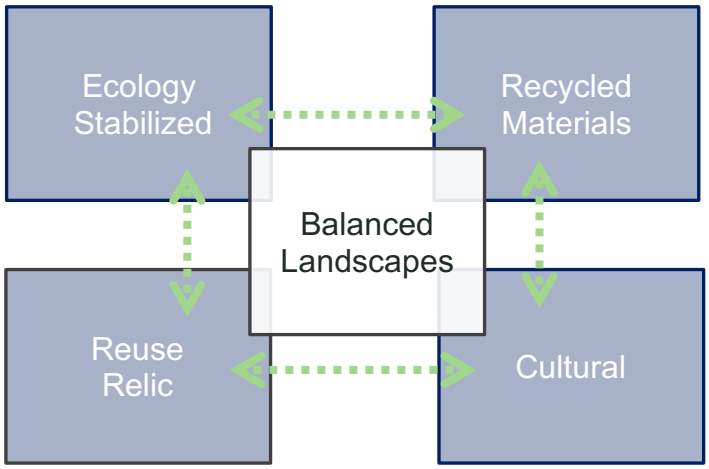

Figure 2 :Landscape of Infrastructure factors are Interconnected (Espinoza, 2018)

2.2: Drawing Design Criteria from the Theory

In the following section, the three themes will be summarized and explained. There was a need to explore other theories Since the Landscape Urbanism framework had limitations when trying to apply it to a site. This

section will discuss three different theories that offered guidance to apply the theory. Lastly, the design criteria created for each theme will be provided.

2.2.1: Drosscapes Theme Summary

Drosscapes need to be understood in the context of the real world and how to include them into the designed urban environment. Through Landscape Urbanism principles to produce new ways and uses of public spaces but also nature and ecosystem services. In urban environments, drosscapes are inevitable. The urban fabric should reintroduce wasted spaces into efficient functional spaces to fix the problem.

2.2.1.1: Guidance in Application – The 3 R's

In order to apply the Drosscape theme, contaminated sites need to be understood. After all, these kinds of sites are complicated and have different levels of toxicity. Researching this process applies to the application of Landscape Urbanism theory on a site because the test site is a Drosscape. By learning how to handle contaminated sites influences the final design criteria for this theme. Moreover, how it is translated to the design of the test site.

There are different ways to remove toxicity levels from a site known as the 3 Rs. The 3 R's are reclamation, remediation, and reforestation. Reclamation is the process of returning disturbed land to its former use or the most productive use. Remediation is the process of removing pollutants or

contaminants from water and soil found in brownfields and superfund sites. Furthermore, the reforestation refers to the reestablishment of trees (forest areas) on non-treed land.

In our previous discussion, drosscapes were identified as a central theme to apply the Landscape Urbanism framework to the practical application on a site. Therefore, understanding the remediation process and how to deal with different levels of contaminants is important to apply the theory to a site. The remediation process helps build the design criteria for this theme.

2.2.1.2: Drosscapes Design Criteria

The criteria developed for the drosscapes theme is the following

- Locate wasted landscapes
    - Reclaim and repurpose underutilized contaminated sites
    - Clean and restore ecological systems degraded due to toxic waste
- Reintroduce ecosystem services
- Conserve Greenfields for ecological and recreational use
- Provide opportunities for new landscapes that enrich people's lives by promoting social interactions

The drosscape design criteria help translate the theory of this theme to site application. The criteria transform wasted urban spaces into the functional landscape by restoring and reclaiming them. These spaces can serve as recreational opportunities for people and ecological services. Also, cities can be planned on these sites and prevent greenfield development.

2.2.2: Terra Fluxus Theme Summary

The Landscape Urbanist needs to understand all the ecological and cultural processes at work on a site to design spaces that function across space and time. The Terra Fluxus theme provides a practical lens to view the theory and how to translate it into a design solution for a project site. Under this theme, the landscape becomes a medium that can be layered, flexible, strategic, and non-hierarchical. It constructs a horizontal field of infrastructure that accommodates all kinds of urban activities planned and unplanned, imagined, and unimagined (Corner, 2006).

The framework introduces indeterminacy as part of the design process that includes programming flexible spaces that address unknown future conditions. Most importantly, the Landscape Urbanist pays attention to context and how the landscape is included in all forms, built, vernacular, natural, and social to understand the forces that shape a project. However, none of Corner's writing provided a design approach, so other theories were explored to aid in the application process.

2.2.2.1: Guidance in Application – Ecological Urbanism

The Terra Fluxus theme had some limitations when trying to apply the theme to a test site. Therefore, other theoretical frameworks were studied to guide the application of this theme. It was discovered that exploring the Ecological Urbanism framework will facilitate the application of this theme. To design a site, the ecological process needed by both humans and the landscape need to be understood. The term 'ecology' has evolved since it first emerged in the 19th century and its relation to biological sciences. It has expanded into the city or urban environment with an increasing focus on landscapes and urban regions. Ecological Urbanism has two dimensions: landscape ecology and urban ecology.

Landscape ecology aims to understand the landscape and how it is shaped its originality and the dynamics that create a landscape. It is defined as viewing the landscape as a structural and functional element within a greater matrix that can be designed. Comprehending how line corridors, strip corridors, stream corridors, networks are major structural characteristics of landscapes that are interconnected (Steiner, 2011, 336; Forman and Godron, 1981, 733). How the landscape is viewed in this theoretical framework relates to the Terra Fluxus theme because it fully focuses on understanding the organizing factors within a landscape. Furthermore, this theoretical framework provides a toolset on how to organize the landscape ecology. For example,

knowing how hydrological systems move through a landscape from major bodies of water to minor bodies to channels.

Urban ecology is the study of the ecological processes and how its patterns change over time, space, and scales within the city, resulting in an urban-based environmental study of the city. This new field emphasizes an interdisciplinary approach to understand the urban environment and the urbanizing landscape. It analyzes the patterns, drivers, processes, and outcomes of a city. "Urban ecosystems as complex coupled human-natural systems where people are the dominant modifiers of ecosystems, thus producing hybrid social-ecological landscape patterns and processes (Steiner, 2011, 336; Alberti, 2008)." For example, the benefits people receive from nature, such as "food, water, and energy. This includes regulatory services, such as purification of water, carbon sequestration, and climate regulation. As well as waste decomposition and detoxification, crop pollination, and pest and disease control (Steiner, 2011)." After analyzing the Ecological Urbanism framework, a design criteria was created to facilitate in the design approach.

The Ecological Urbanism Criteria

- Balance human systems with ecological services
- Facilitate ecosystem services (Green Fabric)
- Creating wildlife habitat
- Preserving ecological areas

- Capture and cleaning stormwater
- Improve human Networks (Gray Fabric)
- Creating new social opportunities like trails along the waterfront
- Enhance cultural history and diversity
- Unite humans to nature

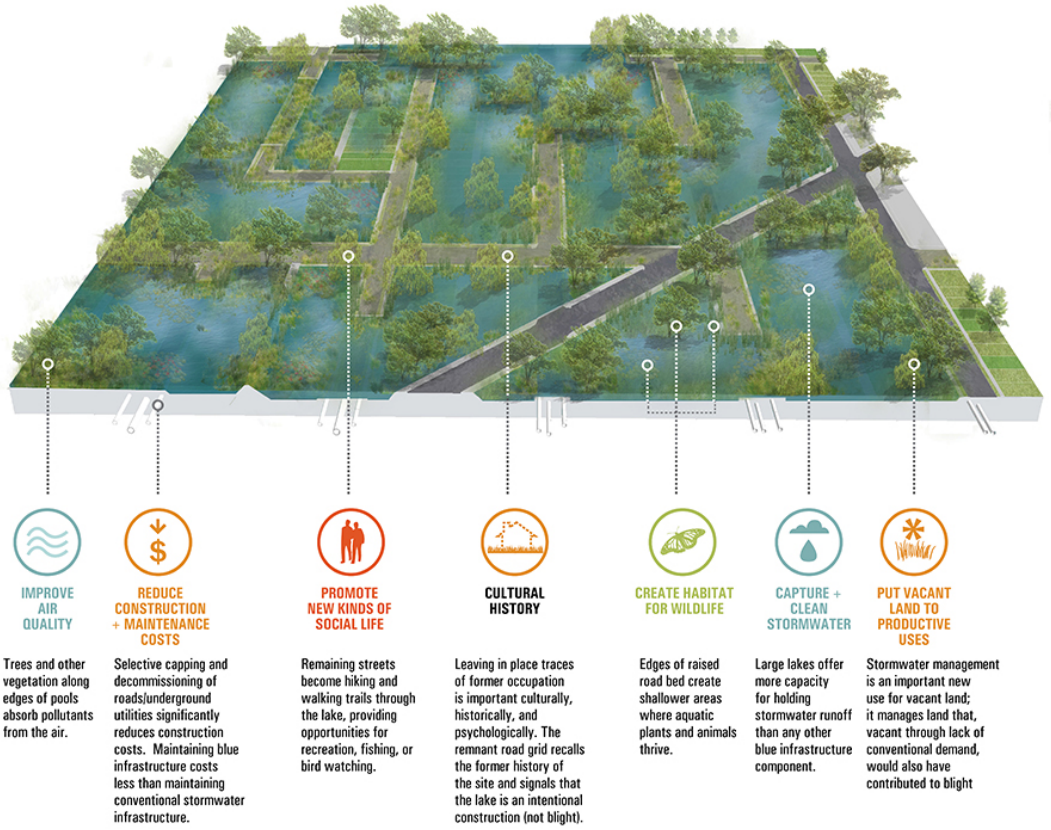

Figure 3: Ecological Framework (Desimini, 2013)

This design criteria clarifies all the system and services humans and the surrounding ecology need. It addresses each system to create resilient designs with new networks and services seen in Figure 3: Ecological Framework.

2.2.2.2: Terra Fluxus Design Criteria

The following criteria combine elements from the Terra Fluxus theme and Ecological Urbanism. The following criteria was used in the final design of this thesis project in order to apply the design elements in practice.

Final Terra Fluxus design criteria:

- Explore the ecological and urban processes across a site
    - Improve how networks are designed such as roads, trails, and neighborhoods to include ecological spaces while creating habitats that preserve ecological areas
- Repair and Improve natural systems
    - While creating new social opportunities within ecological areas like trails and passive areas
- Creating Resilient designs
    - Reduce future flooding impacts
    - Capture and clean stormwater

The Terra Fluxus design criteria translate the theory of this theme to the application of it on a site. The criteria facilitate the design of both urban and ecological spaces and improves both spaces that are viewed and planned. For example, road networks designed should include spaces for people to walk and bike and provide forested areas.

Designs must repair and improve any existing natural systems like rivers and forested areas. These types of landscapes can serve as passive recreational opportunities for people while providing ecological services. Cities can also plan for future flooding impacts and reduce stormwater pollutes to reduce climatic impacts down the line.

2.2.3: Landscapes of Infrastructure Theme Summary

Landscapes of Infrastructure aims to balance both urban and natural infrastructure. It is essential to note how systems are interconnected in the urban landscape and the natural landscape. For example, how we manage flood events and treat stormwater runoff can also provide recreational opportunities and serve human needs. Under this theme, the Landscape Urbanist needs to create a balanced landscape that can only be achieved by balancing and incorporating four factors. These factors are ecology, recycled materials, cultural ties of a site, and historical reuse, or the reuse of relics within the landscape. Landscape Urbanism projects should include and plan for all the natural and urban infrastructure to create functional hybrid landscapes both in the urban and the natural areas.

2.2.3.1: Guidance in Application – Sustainable Urbanism and Smart Growth

Sustainable Urbanism and Smart Growth principles support the application of the Landscape of Infrastructure theme on the test site. Sustainable Urbanism offers a straightforward design toolset to help plan built areas as well as green infrastructure within urban areas. Sustainable

Urbanism fits under the Landscape of Infrastructure theme because it provides environmentally conscious designs that count for both green and urban infrastructure.

Sustainable Urbanism is the practice of designing urban areas that use sustainable and resilient principles to design, plan, and administrate cities or urban areas (Sharifi, 2016). Sustainable Urbanism's objective is to eliminate how urban developments impact the environment. The overarching goal is to make the town or city self-sufficient by bringing necessities such as electricity and food resources close to the urban development.

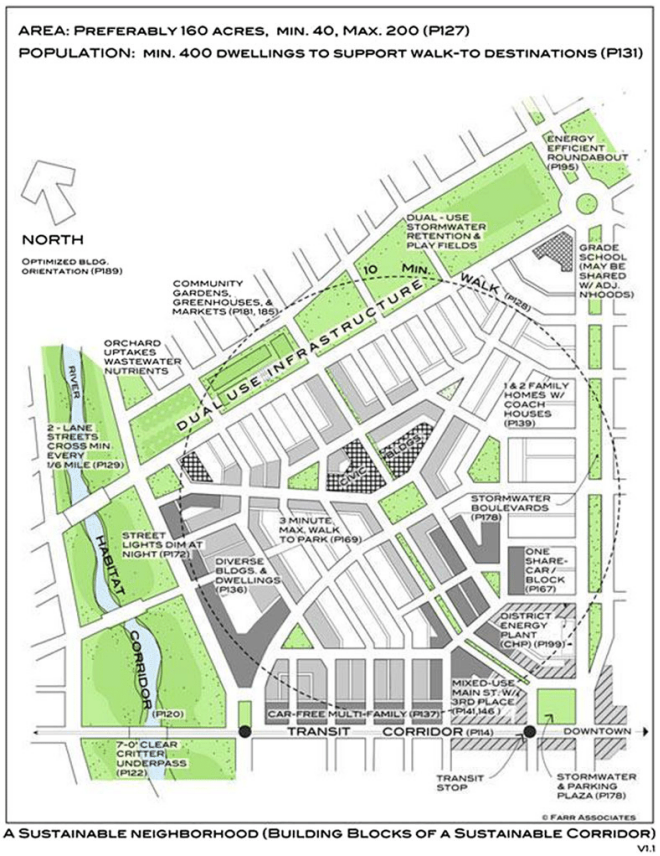

Figure 4: Clarence Perry Unit (Farr, 2008)

Sustainable Urbanism and Smart Growth practices provide specific and helpful implementing tools and guidelines on how developments should be planned and designed. For instance, Smart Growth principles contain urban sprawl by using compact development patterns, utilizing existing urban infrastructure, providing

adequate public facilities and services. The principles also provided a network of transportation services that will not only connect a city but eliminate global warming emissions. Resulting in a mixed-use, high-density town that is interconnected by streets that use different modes of transportations (Sharifi, 2016; Freilich, 2011). While Sustainable Urbanism uses most of the compact development ideology, it also intermixes green infrastructure with social and economic stimulation. Furthermore, the Sustainable Urbanism theory provides a neighborhood unit model in order to design neighborhoods that should be used while designing the urbanscape. As can be seen in Figure 4: Clarence Perry Unit. The framework also includes a neighborhood center with shopping centers and anchoring mix-use areas (Farr, 2007).

The following design criteria were created for the Sustainable urbanism agenda

- Compact mix-use developments
- Provide Alternative Modes of Transportations
- Create wildlife and transportation corridors
- Planned Public Facilities and Services
- Promote Biophilia within the city
- High-performance buildings
- High-performance Infrastructure

By applying these design criteria, development areas can be designed to promote healthier lifestyles while eliminating the impact on the environment

2.2.3.2: Landscapes of Infrastructure Design Criteria

The following criteria combine Landscapes of Infrastructure and Sustainable Urbanism (and smart growth) guidelines into one list. The criteria created was based on the design elements applied to the final design.

The Final Landscape of Infrastructure Design Criteria:

- Organizing the urban environment around the landscape
    - Design compact mix-use developments with different housing styles such as apartments, townhouses, and single-family homes.
    - Managing and treating stormwater that will count for future flood events
    - Provide recreational spaces that are culturally stimulating
- Create and stabilize ecological and hydrological systems by planning for the natural and urban fabric
    - Organize the urban environment around the landscape features
    - Promote biodiversity by creating wildlife and transportation corridors.
- Provide alternative modes of transportation and shared infrastructure to promote more ecological systems.

The Landscape of Infrastructure theme is very complex to apply. Therefore, the criteria above provide a workable framework that simplified the application

of the theme. Under this theme both urban and ecological forms are designed by organizing the infrastructure. This can be achieved by maximizing ecological areas and planning for compact development that responds to the surrounding landscape features. Emphasizing the need for balanced landscape designs should also stabilize both urban and natural systems. Balanced landscape should organize the urban environment around the landscape and promote biodiversity. In this framework, forest areas, shorelines, and streams should be kept protected. These spaces can serve as recreational opportunities that will culturally stimulate people. Landscapes of Infrastructure offers a holistic approach to designing urban, landscape and natural features by interconnecting all these systems together.

Chapter 3: Methodology

The methodology section will discuss four case studies, the site selection process, and how the methodology created was applied across scales. In the case studies, section examples of landscape urbanism projects were selected to develop a sense of scale and how to illustrate the theoretical application to the project site. The site selection section describes how the test site for this thesis was selected and why the selected site was an ideal choice to test the application of the Landscape Urbanism framework. Lastly, the design approach is described for the different scales the test site was examined.

3.1: Case Studies

The following section explains and critiques four case studies under the Landscape Urbanism theory lens. The four projects are FreshKills Park, Gas Works Park, Harbor Point, and Hazelwood Green. These four projects were chosen because they are drosscapes and use infrastructure to remediate the site. Additionally, these four case studies helped choose a test site and aided the design process of the thesis test site.

3.1.1: FreshKills Park, Staten Island, NY

FreshKills Park is located on Staten Island, New York, and is roughly 2,200 acres. Once the world's largest landfill, the site served as the primary depository for New York City's household garbage for nearly fifty years, from its establishment in 1948 to its decommissioning in 2001. The landfill area before the development of Staten Island was primarily composed of tidal creeks and coastal marshland. During its peak years of 1986-87, Fresh Kills received nearly 29,000 tons of trash per day. The four garbage mounds on the site today are made up of almost 150 million tons of solid waste (NYC Parks, 2006).

Fresh Kills Landfill was established in 1948, before the development of Staten Island. By the 20th century, many of the newer landfills located within the city were closed because of new environmental regulations. Fresh Kills remained open because the owners worked closely with the State and City government to retrofit and meet new regulation standards. As of 1991, Fresh Kills was the only operating landfill for NYC. In 1996, environmental concerns

and state politics pushed Mayor Rudy Giuliani and New York Governor George Pataki to a mandate to close the site (Bliss, 2017). The State of New York passed a new law in 1996 requiring the landfill to stop operations by December 31st, 2001. In 1997, two of the four landfill mounds were capped and on March 22nd, 2001 the landfill received its last garbage. However, despite the landfill being decommissioned, the site was used to dispose of the materials from the World Trade Center attacks on September 11th, 2001. Debris from the attacks was cleaned, scanned, and examined on the site and it took roughly ten-month to complete the process.

In 2001, NYC led by the Department of Planning conducted a two-stage international design competition for a master plan development of the site. The competition's end goal was to attract ideas and innovative park designs that would meet the needs of the city's communities and respond to the natural and constructed history of the site while taking advantage of the Freshkills site potential.

James Corner Field Operation’s design was chosen. The firm re-imagined FreshKills by featuring many activities for humans and habitats for wildlife. The design included waterfront recreation areas, sports fields, educational areas, event spaces, and artwork display spaces, as well as meadows, wetlands, and creeks with pedestrian trails, scenic overlooks, and spaces for picnicking, fishing and birdwatching. Design elements also honored the recovery efforts of September 11th first responders.

The redesign of FreshKills Park required thoughtful planning and handling of the hazardous material left behind from the landfill. Some pollutants found were led, arsenic, petroleum products, and pesticides.

The FreshKills Park remediation process included capping the landfill mounds, water purification systems, gas harvesting, and phytoremediation of the contaminated soils. However, the landfill mounds had to be stabilized before they were capped. The mounds were stabilized by layering soil, geotextiles, and a geomembrane that separates the waste from the environment and park visitors. The capped areas required close monitoring because they produced two by-products - methane gas and leachate. The gases were harvested by the department of sanitation and sold to the National Energy Grid, generating roughly $12 million a year in revenue (NYC Parks, 2006).

The new park design addresses potential leachate risk by purifying runoff into both pipes and water treatment facilities. Stormwater runoff is treated through a series of swales, down chutes, and detention basins that move and treat stormwater along with the site. Also, the mounds themselves are graded and sloped to facilitate drainage. Since there is a concern that polluted runoff will reach the river, 238 groundwater monitoring wells were installed to monitor water quality to ensure the system is working correctly.

Veru-Tek Technologies and environmental remediation company used two different phytoremediation techniques on the Freshkills. They used both plants and petroleum by-products to turn toxic waste into nontoxic

compounds. (NYC Parks, 2006). Veru-Tek Technologies also injected biodegradable substances like corn or coconut oil into the soil in order to break down pollutants into harmless by-products.

Field Operations conducted a suitability analysis to understand the site thoroughly. They examined the site's past, present, and future to determine the site's potential and how it changed over time. The firm determined that the Freshkill site should be turned into a natural park since it used to be a forested area with wetlands. The design respects the natural process by phasing and adapting the project and by restoring lost ecological corridors and the waters' edge. The design scheme shows how the site will change over time especially as the landscape matures and more wildlife is introduced. The design aims to connect humans to ecological systems by including passive and active spaces that plan out where humans and ecological services intersect.

The design does a good job balancing the infrastructure needed to maintain the site clean and restores cultural connections to the site by incorporating site histories throughout the park design. All in all, FreshKills Park did fulfill many of the Landscape Urbanism theory requirements and restored this lost landscape into a usable park that not only restores ecology but connects humans to nature.

3.1.2: Gas Works Park, Seattle, WA

Gas Work Park is a 20-acre park located in Seattle, WA. The site formally was a coal gasification plant along with Lake Union. The plant burned

city garbage in the early 1900s and later used to extract gas from coal. In 1956 it was disbanded because gas plants became obsolete and the United States started importing natural gas. The site remained abandoned until the city acquired it in 1965 for parkland. Soon after, Richard Haag Associates was commissioned to prepare concept and master plans for the site, and it opened to the public ten years later as a park that would soon become a source of great community pride (The Cultural Landscape Foundation, 2016; Dunne, Kammer, Schanz, & Walter, 2014; Gonzalez, 2014; Radmer, 2014).

The park design includes several of the old gas plant buildings as ruins and also repurposes old plant components within the park. Although the park does not feature programmed sports fields, it provides areas for unprogrammed sports like archery, kitting, frisbeeing, and much more. The park's design has many open lawn spaces with fantastic waterfront views and views of downtown Seattle.

The process of coal burning can form more than 100 chemicals; however, the two primary chemicals are Benzene and PAHS. The Gas Works site also has Xenobiotic chemicals such as solvents, pesticides, heavy metals, and hydrocarbons. All these chemicals have health impacts if direct exposure happens either via gas exposure or through indirect sources like water pollution. This exposure can cause cancer, neurological damage, kidney, skeletal, muscular diseases (Dunne, Kammer, Schanz, & Walter, 2014).

The park design incorporated different remediation techniques to clean the soils and any runoff throughout the project site. Richard and Haag Associates included bioremediation techniques and phytoremediation to sequester contaminants on the site. They used vegetation and microorganisms as forms of bioremediation. Using bioremediation techniques ensures the safety of the public and surrounding communities because it removes pollutants from the site. The use of microorganisms required monitoring, cultivating, and demobilizing heavy metals found in contaminated soils. A combination of layers of clay and grasses were used to prevent wind-blown dust, minimize soil erosion, and reduce contamination. Bioaugementation, the use of non-native strains and species, was also used to treat the site. Lastly, they used topo-remediation, or earthworks techniques to form hills and swales to help dilute rainfall contaminates into the river (Dunne, Kammer, Schanz, & Walter, 2014).

Unfortunately, all these remediation efforts were not enough and air sparging was introduced. Air sparging pumps air into the ground where contaminants enter the vapor stage and then are extracted to the surface where they can be treated or burned off (Dunne, Kammer, Schanz, & Walter, 2014).

3.1.3: Harbor Point, Baltimore City, MD

Harbor Point is a 27- acres waterfront property located in Baltimore City, MD, also known as the Honeywell Baltimore Site. It was

formerly a chrome processing and manufacturing facility and has undergone a remediation and redevelopment process.

In the 1980s, as the first environmental investigations were conducted, the (EPA) detected a large amount of chromium being released into Baltimore Harbor. Despite the findings, the plant continued to remain open until 1986 when it shut down because of economic conditions and overseas competition. As the site was decommissioned, additional studies on the site's toxicity levels were conducted, concluding in the EPA completing a $110 million clean-up. By 1989, the EPA, US Department of Justice, and the Maryland Department of the Environment entered a Consent Decree to dismantle the existing plant's infrastructure.

The primary contaminant at Harbor Point is chromium in the soil and groundwater. The Consent Decree also provided two performance standards. The surface water performance standard demands that chromium is reduced to standards surface water performance and groundwater gradient performance 50 parts per billion ("PPB") for each surface water sample location. Meaning the concentration of chromium needs to be dissolved to that level. The groundwater gradient performance standard expects the groundwater inside the containment structure is lower than the water level outside of it by 0.01 feet. This will be measured hourly and averaged over 30 days (EPA, "Hazardous Waste Cleanup: Honeywell Baltimore Inner Harbor in Baltimore, Maryland," 2018).

As Harbor Point underwent the remediation process, it remained abandoned until 2003 when the Harbor East Development Ground signed a lease with Honeywell and Harbor Point Development. In 2004, 1.8 million square feet of development was approved on the site.

The Harbor Point RCRA Redevelopment project plan has two phases, and it is designed at the master plan scale. The plan was negotiated between Harbor East Development Ground, the EPA, and the Maryland Department of the Environment (MDE). Phase 1 included the reopening of the site, an office building (the Thames Street Warf Building), and the Exelon building. The Exelon building includes a 65,000square foot trading floor, 39,000 square feet of street-level retail,103 residential units, and a 750-car parking garage. Phase two includes an 18,000 square feet Apartment building and two office buildings totaling 326,940 square feet. The third phase includes a 222,000 square foot hotel, another 438,199 square foot office building and a 346,000-square foot apartment tower which all include street-level retail.
The total buildout of the Harbor Point RCRA project will include office, residential, retail, and hotel building and 9.5 acres of parks and open space. The design includes a waterfront promenade (EPA, 2018). Additionally, the site has 18 acres of waterfront property that is close to Baltimore's Inner Harbor (EPA, "Hazardous Waste Cleanup: Honeywell Baltimore Inner Harbor in Baltimore, Maryland," 2018).

The Harbor Point redesign prioritizes the urban and social environments for humans. The redevelopment plans include hotels, offices,

retail space to residential units that capitalize on both social and economic boundaries. However, the plans and designs fall short on the ecological and cultural realm. The designers failed to connect the redevelopment to the history revolving around this site. Simple design decisions like traditional building materials and names to understand the context of the site and tying the design back to surrounding neighborhoods would reinforce any of the cultural components of the Landscape Urbanism discourse.

In the ecological realm, the design falls short because the designers did not prioritize habitat creation. Missed opportunities in adding more green spaces such as parks, green roofs, and naturalizing at least one of the edges to help aid the ecological process. Even the park included could have been designed to be more functional for both social needs and environmental services. This would make the design functional and productive, thus fulfilling another Landscape Urbanism component. Lastly, the design does not embrace the process of time by adapting to future needs that would create more dynamic spaces that people will enjoy and want to live in and visit.

Harbor Points' current design lacks uniqueness and placemaking even though there is a lot of history on the site and a mature urban fabric to tie back to like Fells Point, a neighboring community. The current design plans do not differ from other urban projects happening in the cities because the same building language is being applied, and little consideration is given to the ecological services needed. Although the Landscape Urbanism discourse is not perfect, it does provide a feasible framework that cities like Baltimore

should apply because the basic principles will make spaces more dynamic and functional landscapes.

3.1.4: Hazelwood Green, Pittsburgh, PA

Hazelwood Green is a 178 acres plot located in Pittsburgh, PA along the Monongahela River. This site is one of the last urban brownfields in the city of Pittsburgh. It was a steel mill that will be transformed into a mix-use development with retail, offices, housing, research, public open spaces, and trails.

The plant opened up for business in 1883 by Jones and Laughlin Steel Company that wanted to capitalize on the Monongahela River and created an industrial hub along the river. During its prime years in the 1960s, the plant had 12,000 workers and caused an increase of residents in nearby Hazelwood neighborhoods. By 1974, marked by the decline of steel, the plants only employed 3,600 workers. The site was purchased by Ling-TemcoVought Incorporation (LTV). But the plant remained open for two more decades. By 1998, the Hazelwood community only had 6,000 residents and was in decline (Almono LLC). Between the years 2002 to 2015, the site went through the environmental remediation and the Site Prep Process to be in accordance with Act II, known as Pennsylvania's Land Recycling and Environmental Remediation Standards Act compliance and clean-up requirements. Currently, the site owner is moving forward to finalize the master plan and zoning of the area.

Hazelwood Green owners have reported a few contaminants found on-site and how they have addressed them. The Contaminants found were Petroleum/Petroleum Products and Volatile Organic Compounds (VOCs). They have stated they are going through the environmental process to be in compliance with Act 2. The owners and designers have not been as transparent as other case studies. In particular, they are not providing information on the measures and controls they are taking as they move forward with development. The site will be capped; however, more remediation process may be needed in Area B where the Mill Building and Coke Ovens were, however, very little has been said about the process and how they will be addressed.

Almono LLC (the developer of the site) conducted many studies that produced different neighborhood plans and visions while the site was being remediated. In 2013, the city finally approved the Preliminary Land Development Plan (PLDP). This plan states that the site will be a Specially Planned (SP) district with zoning type SP-10 Zoning Text.

The vision for the Hazelwood Green incorporates the public realm throughout the site by reserving 20% of the total acres for public spaces. The site developers are prioritizing pedestrian access and safety to and within site by providing bicycle routes and pedestrian walkways and transit options. The transit options include bus, rail, aerial gondola, and rideshare. By prioritizing the public realm in the site design, it will be meeting conditions in the LEED for Neighborhood Development Plan, which simply plans spaces while

keeping the entire community in mind. Almono LLC aims to create a network of well-connected neighborhoods that are safe to all users while meeting sustainability standards. They also want to think about the communities and the kinds of amenities they need, such as walking trails, parks, playgrounds, and event spaces. Currently, the site is divided into three districts: The River District, Mill District, and Flats Districts; however, there is limited information on the details of each district

3.1.5: Major Case Studies Takeaways

The potential site should include wasted urban space (drosscapes), where ecological systems can be uncovered in the existing urban environment. The site should have opportunities for combining engineering infrastructure, landscape design, and urban strategies for functional human and ecological spaces that consider the landscape form. It should have opportunities to respond to flooding issues, treat stormwater, and provide recreational opportunities while enhancing biodiversity. Ideally, a site in a city would be better suited for the Landscape Urbanism dialogue because human ecology and ecosystem services should be interwoven with the existing city form.

3.2: Site Selection

During the site selection process, drosscapes helped determine potential sites using Google Earth and web searches of neglected areas in

Baltimore, Maryland. Once several of these were identified, they were evaluated by examining:

- How does the site connect to existing urban infrastructure?
- What potential and current environmental opportunities, such as the sea-level rise and flooding impacts the site may have?
- What kind of social impacts and interaction does the site have compared to other potential sites?
    - Does the site of any existing community ties?
    - Can existing or potential community services be improved such as waterfronts, parks, buildings, and gathering spaces.
- Does the site of any economic and equality value if it were developed especially for a community?
- How much history is available on the site?
    - By conducting a quick search of any published books and online sites

Ultimately, after reviewing three sites, Sparrows Point in Baltimore, Maryland, was chosen because it met all of the items listed above. Sparrows Point is a 3,100-acre abandoned site. It is only twelve miles from Baltimore City and on the Patapsco River near the Chesapeake Bay junction (Simmons, 2016; Bethlehem Steel Company, 2000).

Sparrows Point is a mega drosscape; it officially closed its last Mill in 2012. The site has extreme sea-level rise and storm surge patterns. The predictions indicate that most of the sites will inundate, especially along the shorelines. The site's close proximity to Baltimore city and access to the Patapsco River can lead to potential connections to the inner city via different modes of transit, like boating and water taxis seen in Figure 5: Sparrows Point,

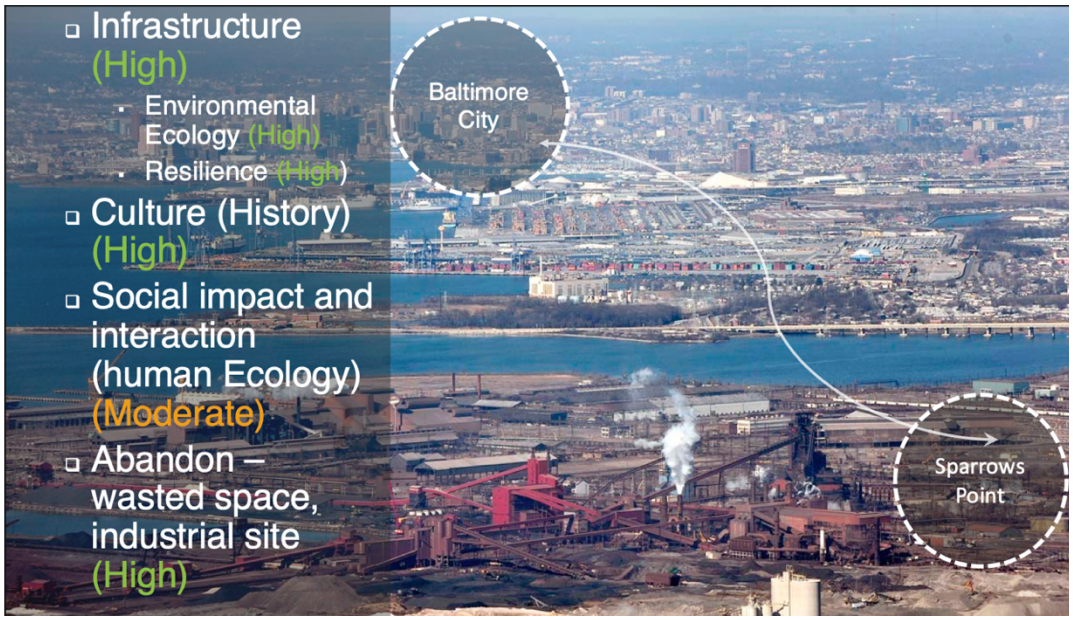

Figure 5: Sparrows Point, Baltimore, MD proximity to Baltimore City 30-minute drive (Hairston, 2012; Espinoza,2018)

Baltimore, MD. Sparrows Point also has a rich history and an active community of former company town residents. All these factors make Sparrows Point the ideal site to test the boundaries of Landscape Urbanism and how the theory can drive a design project.

3.3: Methodology Across Scales from Framework to Application

In order to apply the Landscape Urbanism framework to the redesign of Sparrows Point, the design criteria were broken down into three application

scales: Master Plan, Town Scale, and Neighborhood Scale. The exploration through various scales ensured that the theoretical framework could be fully explored because different site constraints and opportunities are revealed within each scale. Also, the Landscape Urbanism framework states that designs should be designed across scales.

3.3.1: Master Plan Scale

In order to design the master plan of Sparrows Point, a design criteria was created to help apply the theoretical framework. Moreover, the criteria allowed the designer to create a list of features to fulfill the Landscape Urbanism framework. The following Master Plan Criteria were created:

1. Infrastructure
    - Existing Ecology
    - Potential Resilience efforts
    - Existing roadways, buildings and other urban infrastructure like utilities
2. Culture (History)
3. Social impact and interaction (Human Ecology)
4. Abandoned – wasted space

At the Master Plan Scale, the landscape urbanist must understand the infrastructure of a site such as the existing road networks, ecological corridors, and if the project site has any resiliency potential or future impacts such as flooding, and sea-level rise. Sparrows Point ranked high in this category because it has existing road networks and potential waterway

connections. Also, the site has existing ecological network works such as streams, channels, wetlands, and some forested areas.

The landscape urbanist has to understand the site's existing culture and history. They need to know what is happening on the site and what has happened in order to create meaningful designs for the people that will use the area. It is very important to understand Sparrows Point's rich history and the culture surrounding steel mills and company towns. And translate that information into the redesign of the area. For example, in the Hazelwood Green case study, the master plan included three districts that were named after the previous steel mill on the site. This same logic was used on the Sparrows Point redesign of road networks and towns.

At the master plan, the criteria developed tells us to acknowledge any social impacts and interactions between human environments and the ecology. Therefore, avoiding heavy urban development needs near streams and the water edge is important. While providing opportunities for human use. Lastly, new development should happen on drosscapes versus developing green fields.

3.3.2: Town Plan Scale

At the town scale, the Master Plan Criteria used above was used to design the town scale. The Landscape Urbanism framework becomes difficult to apply using the master plan scale criteria.

At the town scale, the landscape urbanist must understand the existing infrastructure and what the future infrastructure might look like. They are

concerned with where to place roads, streams, wetlands, and buildings. At the town scale, it is needed to protect the water's edge by place building and road networks away from the edge. Also avoiding any resiliency issues like flooding or sea-level rise. Include forested areas and plan to start thinking about stormwater and how it will be treated. This fulfills the infrastructure component of the criteria.

As mentioned above, Sparrows Point history and culture is used in the redesign by naming each town and road after that history and start to think about the building typologies, and materials at this scale and the urban form. In order to fulfill the third item which is social impact and interaction, the framework tells us to plan parks, trails, and forested areas and how people will use these spaces within their communities.

For example, within the town's community, parks are planned, but within riparian areas, implementing a more passive design approach like trails that would allow the conservation of the areas. Lastly, the landscape urbanist has to avoid creating drosscapes in the new development areas and try to create a functional landscape within these wasted areas. The framework plans for roadsides, gaps between developments, and underpasses.

3.3.3: Neighborhood Scale

In order to apply the Landscape Urbanism framework at the neighborhood scale, the master plan criteria had to be expanded on because the original criteria were too broad. The following criteria were established for the neighborhood scale of this thesis project:

1. Restore and Reclaim Drosscapes into active landscapes
2. Create Landscape Infrastructure
    - By reviving any cultural elements (History)
    - Restore Ecological Services
    - Create designs that are Resilient and adapt over time
    - Combine systems that balance engineered spaces and allows for the organic process to occur
    - Reclaim any natural and hidden systems
3. Rebuild lost ecological and social communities
    - By repairing and Improving natural systems, while drawing out meaningful and poetic landscape elements
    - Create Active and passive spaces and maintaining social interaction in these spaces

At the neighborhood scale, the urban form and how it impacts spaces that are created become a designing factor. For example, it is not just about finding and recognizing drosscape, but reclaiming these spaces into functional areas. Therefore, any leftover spaces become community parks, nurseries, and stormwater treatment areas at this scale. The landscape urbanist starts thinking about the details within the neighborhoods and how drosscapes, infrastructure, and historical ties shape a neighborhood.

To meet the infrastructure criteria within the neighborhood scale, systems are combined to allow engineered spaces and natural areas to coexist together without causing conflict. Natural areas should self-

organization and never be hidden while urban areas will naturally have more utilities and infrastructure but should still include green infrastructure. Additionally, development areas will have some of the architectural elements found in Sparrows Point.

Like the previous scales, urban spaces are organized and designed around ecological services and resilient factors. However, it becomes essential to rebuild and balance both ecological and social communities within natural areas by planning both active and passive spaces in appropriate areas.

Chapter 4: Sparrow's Point

In the following section, we will discuss Sparrows Point's essential Landscape features used for this thesis project. The features are history, pollution legacy, and present use as well as essential Landscape features used for this thesis project. These factors have to be acknowledged and incorporated into a design to apply the Landscape Urbanism framework to the site.

4.1: General Overview

Sparrows Point is a massive site left underutilized and abandoned for eight years. On the one hand, the site's pass steel mill activity has caused high contamination levels rendering the site a public hazard. On the other hand, the site has many potentials, such as its extensive shoreline, proximity to Baltimore city, and surrounding Dundalk community. Redeveloping parts of

this site could lead to both economic and social equity for those willing to invest in the property. Most importantly, remediating and reclaiming this lost landscape has many benefits. Like improving surrounding people's quality of life and health. To the overall environment because less pollution would be runoff into the river.

4.2: Historic Use

Native American tribes lived on Sparrows Point marshlands for over 8,000 years until 1652, when 400 acres were granted to Thomas Sparrow by Cecil Calvert. During this timeframe, Calvert was trying to attract settlers to this area known as "the great northern woods (Barry, 2017)." A proprietary land granted Thomas Sparrow Sr. 600 acres more acres of land (Barry, 2017). Sparrow senior never lived on the property, but his son Solomon Sparrow built a home in 1664 on the property and called it "Sparrow's Nest." By the 1700s, more families moved into the area and built homes, hunting lodges, and farmed as well as raised crops.

In the 1860s, Fitzell's family-owned 385 acres that they used to raise peaches and renamed the area "Sparrows Point." Eventually, in 1887 the Fitzell's family sold their land to the Pennsylvania Steel Company for its subsidiary, Maryland Steel Company. Pennsylvania Steel was interested in the site because of its ideal location, which allowed the importing of raw

Figure 6: Peach Farm on Sparrows Point, (Berry, 2017)

materials such as iron ore from Cuba efficiently. Maryland Steel Company opened in 1887; Sparrows Point soon housed not only a steel company with large mills but also a company town with over 3,000 people living within the city. The company town had its hospitals, schools, and banks. In 1888, the steel company was given total control over the city by the state of Maryland. The Maryland Steel Company could hire teachers for the local schools, manage the collection of garbage, and enforce laws. On July 27th, 1891, the plant separated into a subsidiary, and it became the Maryland Steel Company of Baltimore County with Frederick Wood as president and Rufus Wood as a general agent. Soon after, a shipbuilding division was added because Wood wanted to improve the plant's technical side. By 1889, the company needed

to expand and added more blast furnaces because it was producing pig iron. Additionally, Maryland Steel was known for creating high-quality rails on its rail mills.

Figure 7: Row Homes on Sparrows Point (Berry, 2017)

By 1893, Maryland Steel had built more homes, hospitals, schools, and training grounds within Sparrows Point. The town offered different housing types from townhomes to detached homes. Historical records indicate that the Sparrows Point community was on the North Western side of the site along J, I, H, E, F, and C Streets.

During WWI, there was a higher demand for workers in the steel mill because more ships needed to be constructed for the war, and they were made of steel. Resulting in an increasing demand for labor, which led to the migration of African Americans within the area (Barry, 2017). Maryland Steel Company provided these steelworkers a barracks quarter within Sparrows Point. The company town offered them temporary housing until they secured a family home within the company town. Additionally, the African American community formed a town in Dundalk just seven miles away from Sparrows Point around Turner Station. The town included schools, churches, grocery

stores, fraternal organizations, restaurants, barber and beauty shops, doctors, dentists, gas stations, liquor stores, and employment office and clothing stores. Later, Turner Station was bought by Maryland Steel CO. in the 1880s from J.M. Turner. Trains passed through Turner Station to get to Sparrows Point from Baltimore City (Dundalk Patapsco Neck Historical Society & Museum, 2017), which made it an ideal place to build a town for steelworkers.

Schooling played an essential role in the company town, and it was incorporated into the organization of the town layout. Sparrows Point Company Town introduced the first kindergarten school south of the Mason Dixon Line in 1892 (Berry, 2017). The company town also had a training school quarter. By 1908, the town opened a High School and seven years later opened Bragg Elementary School for Africa-America children that lived in Sparrows Point and surrounding communities (Berry, 2017). The first streetcar arrived in 1903, and it granted Sparrows Point residents' access to Baltimore City. Residents of Sparrows Point took pride in their town and were very happy to live in it. In 1916, the steel plant was sold to Bethlehem Steel, and it was announced they would spend 50 million dollars on expanding the steel plant. In 1920, Bethlehem Steel company added 12 hot mills for the new sheet and tin plate plant. By 1925, they said 12 more hot mills, and two years later, they said 12 more mills, resulting in 48 active mills with a capacity of 4,250,000 case boxes or 210,000 tons annually (Barry, 2017).

In 1917, the president of Roland Park Company, a known neighborhood developer in Baltimore, MD, teamed with Bethlehem Steel to plan and build a community within Dundalk. The Dundalk Community was intended to house the projected increase of steelworkers coming home from

Figure 8: Shipyard in Sparrows Point (Berry, 2017)

the First World War. Bethlehem Steel provided ships, tanks, and ammunition for both World War I and World War II, along with the introduction of a pipe mill in the 1950s, which was demolished in the late 1960s. To accommodate a "K" blast furnace, No. 4 Open Heath, No. 12 Coke Oven battery, 45" X 90" slab mill, 160-inch plate mill, and the 48- inch cold tandem mill, resulting in a peak of 33,000 workers in 1959 (Berry, 2017). Sadly, as Bethlehem Steel expanded, they tore down homes in blocks C through F street to add an Open Hearth for the production of steel furnaces, and by 1972 the entire town was demolished to make room for a massive "L" blast furnace. However, the Steel business was still booming, and people still had jobs even though most steelworks lost their homes.

4.3: A Legacy of Pollution

As deindustrialization occurred throughout the United States and the steel business dwindled because of shared manufacturing and decreased earnings and employment rates, many steel companies fell into disappearance (Rowthorn and Ramaswamy, 1997; Berry, 2017). As well as new health policies and innovations in the steel making process, caused steal plants like Sparrows Point to end production. Bethlehem Steel Company was forced to fire several people and move its operations overseas, like many other companies (Berry, 2017). Bethlehem Steel Company sold the property to Baltimore Marine Industries Inc., a subsidiary of Veritas Capital. As an unsuccessful restricting attempt, Baltimore Marine operated the facility that had a shipyard that repaired and refurbished ships until 2003.

As the Steel business dwindled and ownership of the Steel Mill was passed from auctions to owners, the plant finally closed in 2012. When the Steel Mill finally closed, Sparrows Point became a drosscape with it taking people's jobs, homes, and

Figure 9: Sparrows Point Steel Mill Community (Berry, 2017)

way of life. Sparrows Point has remained a drosscape since 2012 with very little human and ecological activity because of its toxicity levels.

4.4: Present Use

At present, human use of Sparrow Point is sparse. The steel mill plant's inventory of existing infrastructure reports still having two landfills, one mega shipyard, one coke plant (that included coke ovens, and landfill), Tin Mills, Tin Mill Canal, Rod and Wire Mill Sludge, Finishing Mills. Currently, all the buildings of the steel plant's glory days have been demolished and removed from the site to eradicate off-site and point source pollution.

Figure 10: Sparrows Point becomes a Drosscape (Davis, 2015)

Presently, Sparrows Point is owned by Tradepoint Atlantic, which is owned by Chicago-based Hilco Global and Hanover-based Redwood Capital Investments LLC. In 2014, these investors bought the steel mill property out of bankruptcy for $1 million because the plant had been closed for two years. Upon purchasing, Tradepoint Atlantic worked up a plan for the site, envisioning an international trade hub. Economic impact studies concluded that Sparrows Point's new use would lead to $2.9 Billion of economic activity

and growth for the region. The project will provide roughly 9,500 permanent jobs on Sparrows Point and about 17,000 indirect jobs (Simmons, 2016).

While the company undergoes demolitions and the environmental remediation process, they have started leasing to new tenants. These tenants include FedEx Ground, Harley Davidson, Under Armour, and Pasha Automotive Services. In May of 2016, Tradepoint Atlantic announced they would develop a 130-acre retail hub called The Shoppers at Tradepoint Atlantic, which will be just off of Interstate 695. Additionally, they plan to connect 100 miles of private railroad tracks to CSX and Norfolk Southern railroads (Simmons, 2016).

4.5: Defining Features in the Landscape

To apply the Landscape Urbanism framework, we have to learn to define features in the landscape. That will help determine opportunities and constraints for any future redevelopment of the site. Some landscape features are contaminated areas, transportation accessibility, hydrologic fluctuations, and areas subjected to sea-level rise. Sparrows Point has many landscape features that were defined while conducting a suitability analysis.

The site has strong existing infrastructural bones for future developments because the existing and proposed road systems can connect to existing road networks like I695, Route 157 and Route 151, and develop a water taxi or ferry route into the inner harbor in Baltimore City. Additionally, the site still has the existing town road systems that can be reused in the

development of a master plan. As the site is developed, sea-level rise impacts need to be addressed in the early stages of development to avoid any future risk to residents. Since sea-level rise projections profoundly impact most of the site by making informed decisions early in the design and planning process vital.

Most importantly, the site needs to be remediated and reforested for any real future development. It is essential to phase the remediation and reclamation process to successfully clean the site but also to gain the public's trust in this wasted site (EPA, 2017, 2018; EA Engineering, Science, and Technology, Inc., PBC, 2016). Sparrows Point has the potential to reconnect Baltimore County residents with nature and the historical importance of this site by restoring the water's edge and reintroducing forested areas and teaching the people about the steel mill glory days. All in all, the site has excellent potential for both future ecological and human systems.

Chapter 5: Design

In the next sections, the site analysis process and how that led to the design of Sparrows Point will be discussed. The theoretical framework was examined at three different scales in order to apply the theory to a project site. The three scales are master plan, town, and neighborhood scale. It was found that scale plays a necessary part when translating the theoretical framework.

5.1: Site Analysis

To design the site through the Landscape Urbanism lens, the landscape needs to be understood. The first step was to conduct a site analysis of the site, followed by a land suitability analysis. The site analysis provided initial site information in the broader context, such as locating bodies of waters and forested areas. Some other questions asked during the initial site analysis were the following:

- What kinds of human interactions and infrastructure are on the site?
    - How can a designer connect to them?
- Does the site have any sea-level rise or storm surge impacts since it is a peninsula?
- What kind of pollution hazards are at Sparrows Point?

To fully understand the landscape, a land suitability analysis was conducted. The land suitability analysis determines the fitness of a given area of land to define uses (Hopkins, 1977; Steiner, 1983; Steiner, Mcsherry, & Cohen, 2000). This tool is a more holistic approach to understanding the spatial factors within a given site. Therefore, fitting into the Landscape Urbanism discourse by allowing us to understand the landscape.

By conducting a land suitability analysis, the goal is to understand the past, current, and future uses of the landscape. The land suitability analysis helped identify potential development and conservation areas on Sparrows Point, producing a more holistic design. The land suitability analysis leaded to

the zoning of the site. Six zones were identified based on natural systems, contamination levels, and sea-level rise patterns. For example, Zone F is naturally a peninsula, and it becomes its own area.

Next, the findings of the site analysis will be discussed, which concluded in four factors examined hydrology, contamination, vegetation, and existing transportation of the Sparrows Point.

5.1.1: Hydrology

Sparrows Point has four on-site water sources that look unhealthy. Two ponds located on Bear Creek and Coke Point are heavily polluted and unhealthy, as shown in the image. The unhealthy conditions are reported in the Corrective Action Final Decision for Sparrows Point LLC-Tradepoint Atlantic Parcel B-16 (Tin Mill Canal) in the Sparrows Point Report. The other two water sources are channelized streams that also need to be cleaned up due to their unhealthy appearance and past use. Phase I Offshore Investigation Report for the Sparrows Point Site and a public meeting held on June 20th, 2017 Sparrows Point Steel Mill Environmental Cleanup report offshore pollution caused by runoff and pollution seeping into the groundwater systems. These reports also state that the entire shoreline at Sparrows Point is at risk, and it is advised not to fish, swim around the area (EPA, 2018)

Additionally, Sea Level Rise projections show us most of the site is at risk to flood. Most of the inner parts of the site and all of the shorelines will inundate seen in Figure 11: Sea Level Rise Impacts. Therefore, about half of

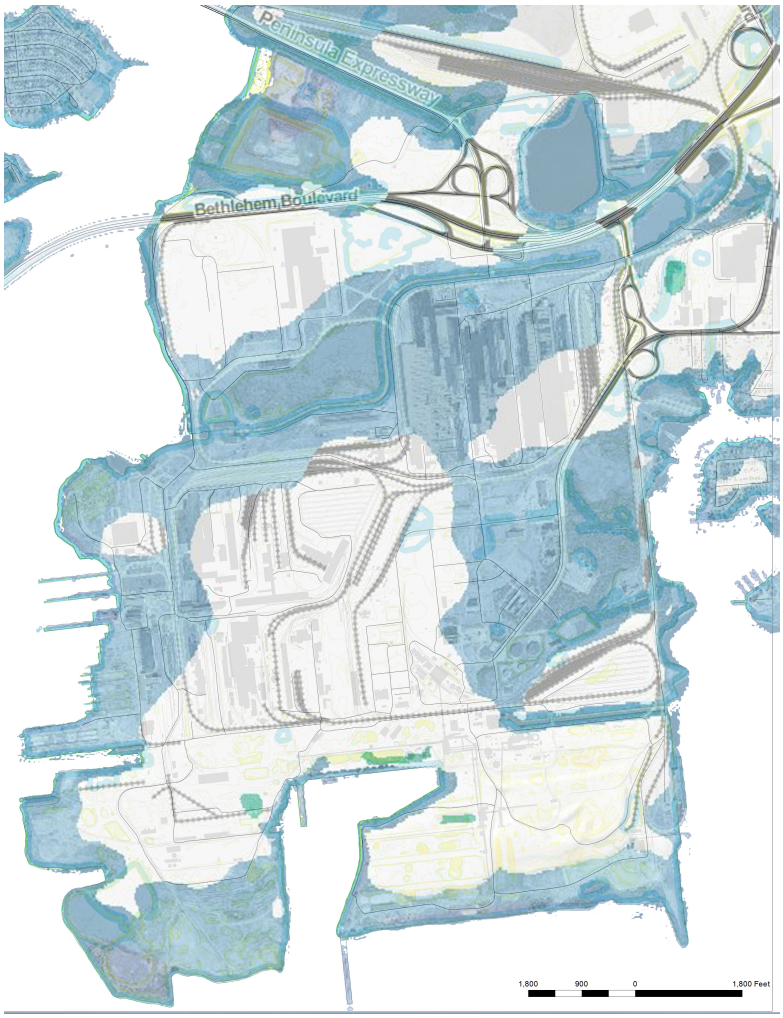

Figure 11: Sea-Level Rise Impact (Espinoza, 2018)

the site will experience flooded areas as sea levels rise. Future developments designed around sea level rise areas must estimate for this change. Ideally development areas should avoid these flooding areas and adequately planning for flooding issues, especially since Trade Atlantic has not released any masterplans.

5.1.2: Contamination

Sparrows Point faced many pollution hazards due to decades of steel making shown on photos, maps and images. An Environmental Site Assessment conducted by the EPA found around twenty-five contaminates on the site. "Contaminants include antimony, arsenic, cadmium, chromium, copper, iron, lead, manganese, nickel, tin, zinc, ammonia, benzene, cyanide, ethylbenzene, naphthalene, PAHs, toluene, xylene, coal tar, oils, lime sludge,

sulfuric acid, waste alkaline rinses, mill scale, and shipyard wastes (EPA, 2018)."

The substantial activity at the sheet and tin plant in Sparrows Point contaminated Bear Creek because of all the discharged wastewater from the Tin Mill into the creek. The EPA's environmental assessments stated that most hazard contamination is in Bear Creek because pollutants are still washed down into the creek, and decades later, the aftermath is still present in Sparrows Point and the surrounding areas.

In 1997, the EPA, Maryland Department of the Environment and Bethlehem Steel, signed a Multimedia Consent Decree outlining contaminated areas and action plans. Since then, annual consent decrees have been approved to highlight contaminated areas and the process made on the site. However, little work has been done to clean up the area since 1997, and the surrounding community members and business owners are extremely concerned (Chesapeake Bay Foundation; Berry, 2017). Sparrows Points owners have faced numerous complaints because they failed to follow environmental laws. Additionally, the Chesapeake Bay Foundation has highlighted five priority areas of interest that are causing pollution problems near the shorelines of Sparrows Point seen in Figure 12: High Priority Areas.

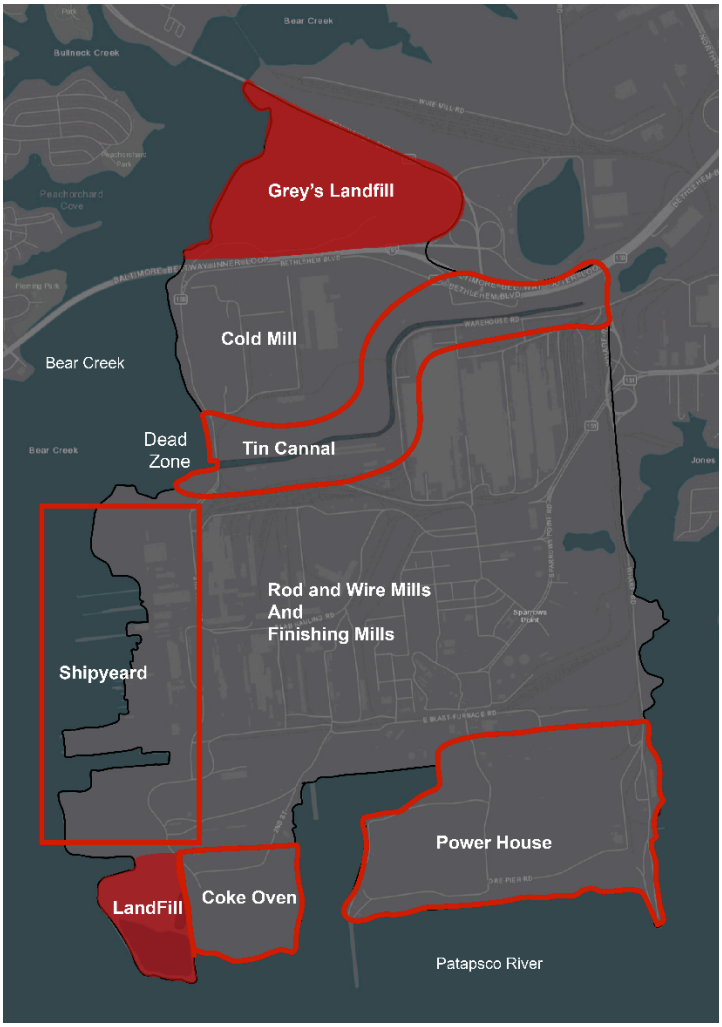

Figure 12: High Priority Areas (Espinoza, 2018)

They include Coke Point Landfill, Coke Oven, the Shipyards, Tin Canal, and Greys Landfill. The space between Tin Canal and Bear Creek is considered a dead zone (Chesapeake Bay Foundation). "Dead Zones" in the Chesapeake Bay are areas with a low amount of oxygen caused by excessive nitrogen and phosphorus pollution. Since there is no oxygen in the water, fish, crabs, oysters, and other aquatic animals suffocate. Also, these high nutrient levels create dense algae blooms that block sunlight and prevent underwater grasses depleting food supply and shelter for waterfowl, blue crabs, and juvenile fish (Chesapeake Bay Foundation).

5.1.3: Vegetation

Sparrows Point has sparsely vegetated areas that are patchy and unhealthy and do not provide suitable habitat. The existing vegetation is also

most likely degraded since it is growing on contaminated soils. Due to Pollution, more than 50% of the site is in disrepair. Sparrows Point has a few functioning water systems on-site that need to be improved, such as the Tin Canal, the Bear Creek pond system, and the lower southern canal system that connects to the most prominent forested patch. The most significant system on site is the shoreline - once it is clean up and revitalized, it can be a beautiful living shoreline with able ecosystem services.

5.1.4: Existing Transportation Infrastructure

Sparrows Point has access to I695, Route 157, and Route 151. It also has some leftover roads from the steel mills' glory days. Riverside Dr is a road that follows the Patapsco River shoreline. It granted access to the shipyard, landfill, Cold Mills, Tin Mills, and Blast furnaces. Although most of the transportation roads on the site are dirt roads, see Figure 13: Existing Transportation Networks.

Figure 13: Existing Transportation Networks (Espinoza, 2018)

5.2: Master Plan

The Landscape Urbanism discourse at the master planning scale helps protect and identify ecological corridors, networks, and any environmental impacts on a site. Moreover, the urbanist needs to understand the conditions of a site, cultural, and social impacts. Thus, spaces can be designed to be resilient and increase ecological potential on-site. In doing so, the landscape itself becomes the medium in which we design and articulate the relationships between urban infrastructure, public events, and uncertain urban futures (Waldheim 2006). The landscape becomes a model for the urban development process.

5.2.1: From Design Criteria to Application

The final master plan of Sparrows Point needs to fulfill each item of the master plan criteria created in the methodology section. These criteria elements were used to design the master plan by applying each item. The following four criteria items will be explained in the next section

- Infrastructure,
- Culture (History)
- Social impact and Interaction
- Avoid creating drosscapes in the new landscape

Understand a project site's Infrastructure:

The land suitability analysis conducted during the site analysis process helped design the master plan and provided a further study of the site's infrastructure. The land suitability analysis divided the site into buildable and

conservation areas based on past usage, existing infrastructure, and future conditions.

For example, exiting stream areas and shorelines should never be developed because these areas are protected. Sea-level rise patterns show these areas are valuable. Additionally, developing the shoreline will cause more problems to the site and the environment over time. Therefore, we have to avoid massive urban development near streams and the water edge.

Additionally, the land suitability analysis identified three development areas by avoiding the site's sensitive areas. Sparrows Point has other infrastructural elements that are important to the final design, such as existing road networks on and off the site. New roads were designed to connect back to I695 and Route151. These existing road networks influenced the location of the new development areas because it was necessary to connect back to them.

Research and incorporate the site's culture and history:

The site's cultural and historical context were examined by studying photographs, images, and aerials, and the layout of the steel mill found. This analysis also found the approximate location of the company town. This rich history of Sparrows Point will be included in the final master plan design by naming roads and buildings after a moment in history.

- Sparrows Nest chosen in remembrance of site pre-development state.
- Sparrows Village remembers the company town.

- Bethlehem Village, the company, took over Steel Mill before it became a drosscape.

Understand the social impact and interaction humans have on an environment (Human Ecology):

At the master plan scale, the developed criteria acknowledge any social impacts and interactions between human environments and the ecology. This was accomplished by preserving natural areas while providing opportunities for human activity uses such as trails and passive fields. Therefore, the shorelines will not have any developments, but humans can still use these areas by providing boat docks or areas for kayaking and scenic trails.

Avoid Drosscapes:

At the master plan scale, Drosscapes are avoided at all costs. To avoid drosscapes all spaces will serve a function, whether it is ecological or urban, and by planning development areas to avoid sea-level rise spaces. The urban areas will not have undesirable living areas by residents caused by a changing landscape and future flooding issues.

5.2.2: Master Plan Design

The resulting Master Plan protects and identifies ecological corridors, networks while carving out human development areas seen in Figure 14: Master Plan of Sparrows Point. By understanding the constraints and any opportunities of the test site, the landscape itself becomes the medium of design and articulates the relationships between urban and ecological

infrastructure. By using the landscape as a medium, the landscape becomes a model for the urban development process.

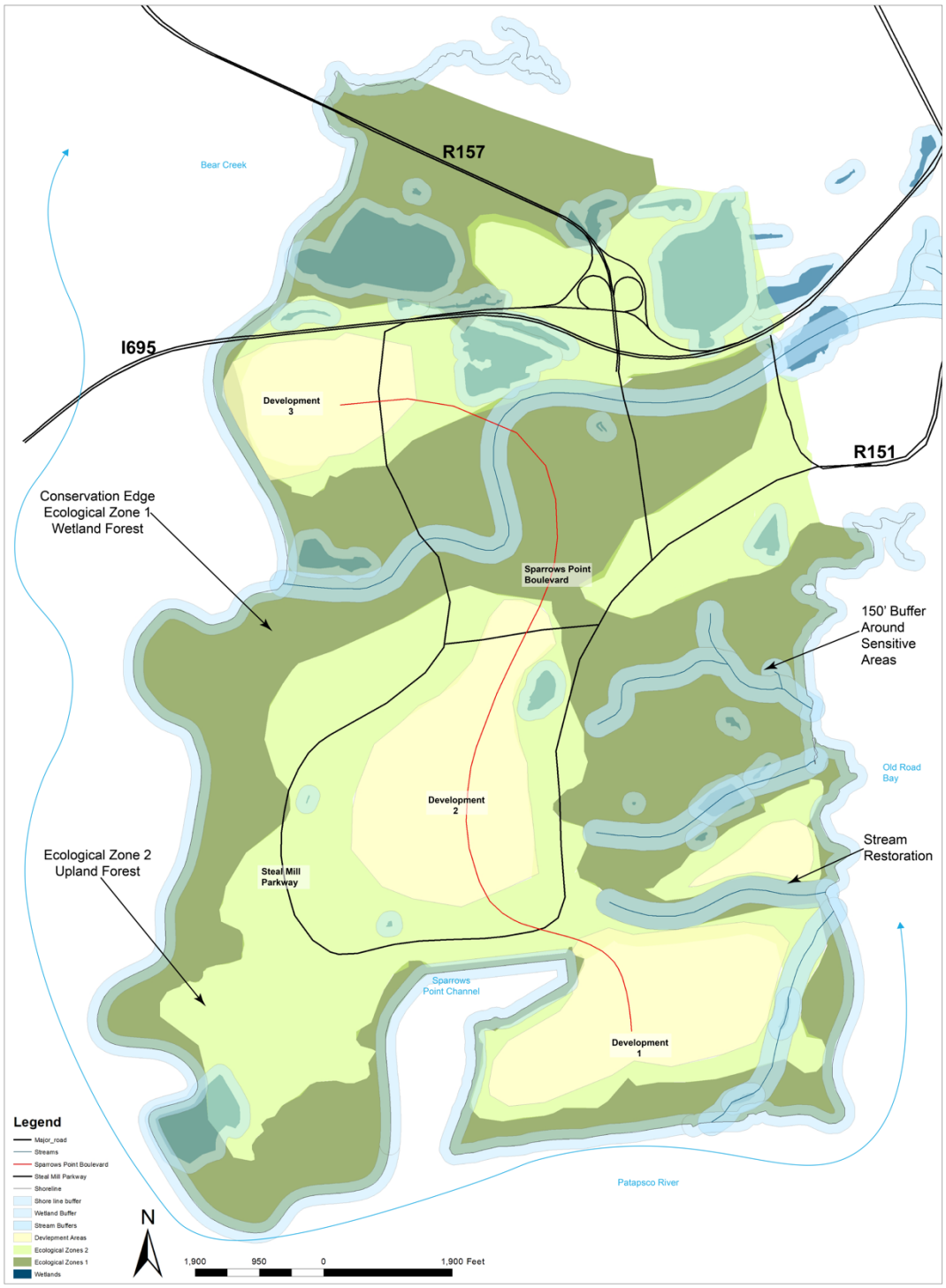

Figure 14: Master Plan of Sparrows Point (Espinoza, 2018)

The master plan has two ecological zones that will consist of streams, wetlands, and forested areas. Sea-level rise projections and existing streams defined these areas. Including two conservation areas provided the site an extra measure of defense from future climatic events. Since the site shows central flooding patterns on the shoreline and upland areas, as seen in Figure 15: Sea Level Rise Impacts overlaid on design.

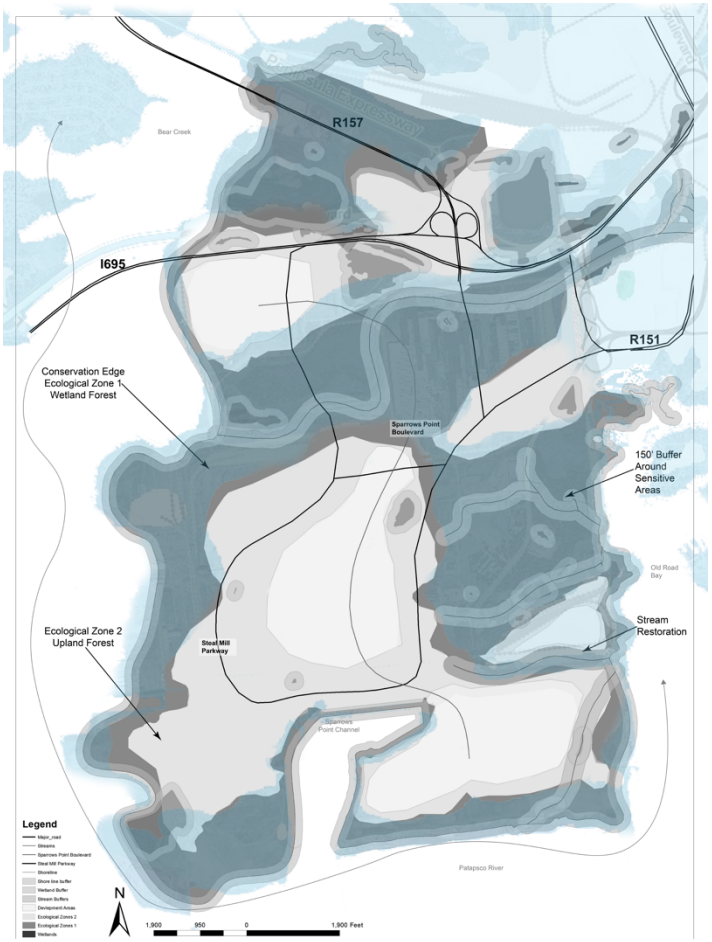

Figure 15: Sea Level Rise Impacts (Espinoza, 2018)

The difference between zone one and two is the type of forest. Zone one or the Conservation Edge will consist of a wetland Forest, meaning it will either be permanently or seasonally wet shown in Figure 16: Ecological Patterns. Therefore, including an arrangement of both hard and softwood plants. Hardwoods are Maples, Ash, and Elms, while softwoods are hemlocks, cedars, and spruce. While Zone 2 Upland Forest will have better draining soils and, in these areas, should not become saturated with water for

extended periods of water. These areas will have a combined coverage of mature species such as oaks and maples with some pines. Also, the site has two existing streams that are channelized; both streams will be naturalized and the western edge along Bear Creek. All streams and shorelines will have 150 buffers to protect these sensitive areas further.

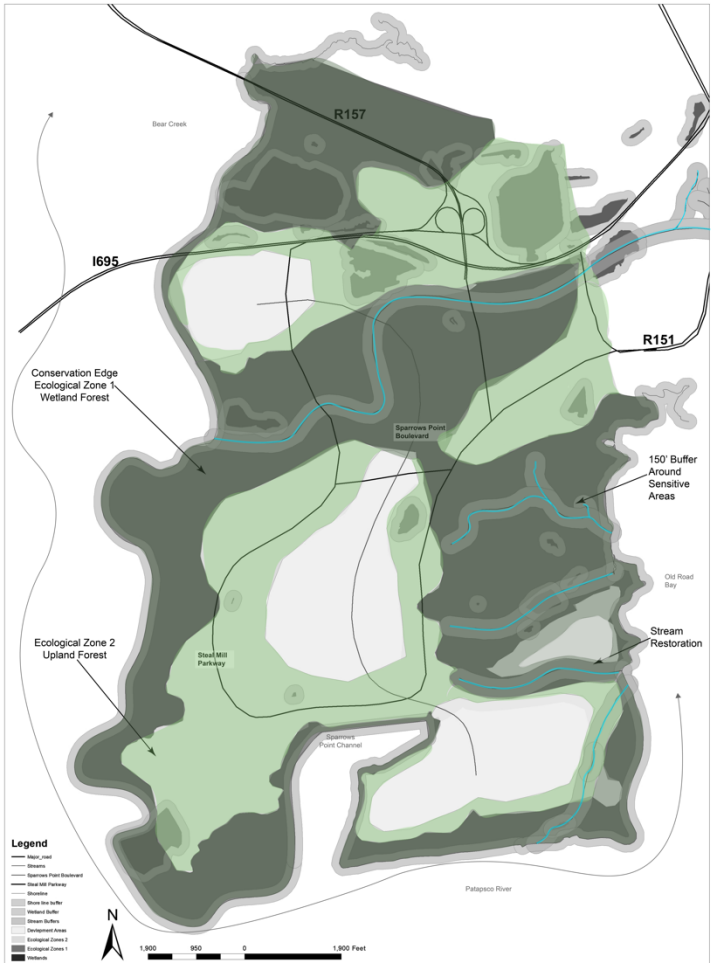

Figure 16: Ecological Patterns (Espinoza, 2018)

Additionally, the future sea level rise projections help shape and form the three development areas on the site. Everything will interact with two major road systems that will connect to existing road systems. Thus, everything will work together and like a machine because the road systems, developments, and ecological areas complement each other seen in Figure 17: Development Areas. The development areas will also balance the historical context of the site past while giving future communities a cultural identity. As mentioned

above, the site's past is honored by naming the development areas after a specific era in time.

- Sparrows Nest named after the first settlement to exist
- Sparrows Village in memory of existing company town
- Bethlehem village, the company that took over the steel company and expanded the steel mill

The design creates a new network of roads that also ties back to the history and existing road infrastructure. Sparrows Point Boulevard will be a complete street with stormwater mitigation and bioswales; it will also connect all three developments. However, Steel Mill Parkway will interconnect all the urban and natural systems. It will take people to various parks and scenic drives to allow them to connect to nature while connecting back to the urban development areas. The parkway will also treat stormwater by moving the water via bioswales.

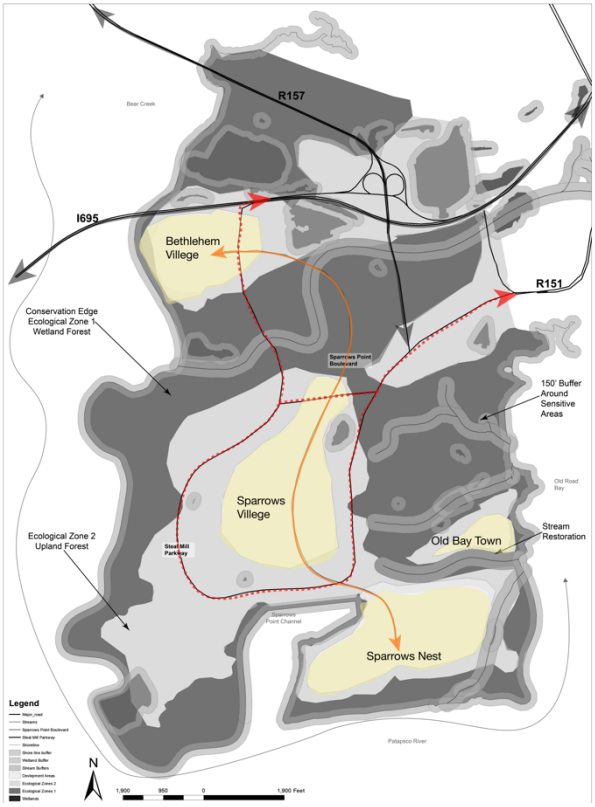

Figure 17: Human Development (Espinoza, 2018)

5.3: Town of Sparrow's Nest

The Town of Sparrow's Nest is a peninsula located along Sparrows Point Channel, Patapsco River, and Old Road Bay. This area was selected to test the theory at the town scale because it had some sea level rise constraints, and a potential development area was identified in the master plan. Also, this area had some existing streams and wetlands that would make the application of the Landscape Urbanism discourse interesting to test.

5.3.1: From Design Criteria to Application

The Town scale used the same criteria as the master plan. Therefore, Landscape Urbanist still needs to understand the project site's infrastructure, history, and social impacts humans may have and need. Also, drosscapes should continue to be avoided. As the site is designed all these factors should be considered and how they will impact the final design decision.

At the town Scale, the landscape Urbanism framework begins to become difficult to apply to a site design because the discourse does not provide any guidelines or policies on how to design a town or neighborhood. The only guidelines given are that the landscape form is the organizing factor and that all systems have to be balanced and interconnected. Therefore, streams, rivers, and the waterfront edge need to be protected and naturalized. The framework tells the landscape urbanist needs to find a balance between the natural and the human environment. Since, the Landscape Urbanism discourse has many shortcomings at this scale; other urban theory was studied. Therefore, both ecological urbanism and

sustainable urbanism are examined to provide supporting information to the theoretical framework of Landscape Urbanism.

Ecological urbanism creates a new vocabulary and understanding of both the landscape and the systems that organize it. Therefore, Community open spaces, ecological landscapes, productive landscapes, and blue-green infrastructure are introduced to the design of the Sparrows Nest. At this scale, it important to understand the relationship between ecological systems and services to urban infrastructure and human ecology. As well as understanding the different landscape typologies and the kinds of usage that will come from each one. The Sustainable Urbanism framework provides a unit model how to design urban development's compactly while including green spaces and pedestrian, destinations.

5.3.2: Sparrow's Nest Design

The resulting plan for the Town of Sparrow's Nest protects the shoreline from development and naturalizes the Powerhouse River and connects two wetlands. The plan also includes a new network of wetlands and streams to capture and treat stormwater from development areas. This new system creates a treatment train to prevent polluted water from reaching significant bodies of water like the Patapsco River.

The site design will have both ecological and production landscapes. Ecological landscapes are those that serve an ecological service and are natural landscapes, while production landscapes are those that serve humans, such as plant nurseries, education/test fields, and solar farms. The

production landscape will not grow food because of the contamination levels found on the site. Over time this might change as the site becomes cleaned and new remediation technologies are developed.

Some of the water systems will serve the production areas where urban agriculture might happen. The urban agriculture areas will not produce food because of the contamination levels on Sparrows Point. Also, a new network of interconnected roads will lead people through the three development areas and to the natural areas seen in Figure 18: Landscape Typology of Sparrow's Nest.

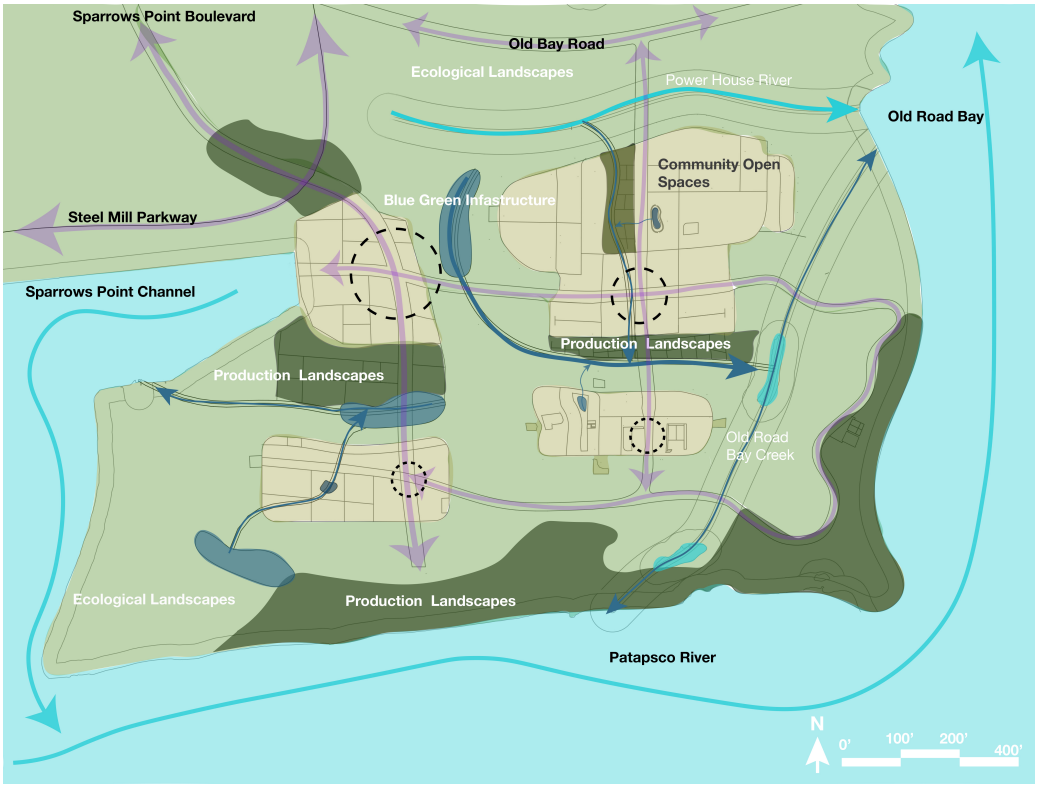

Figure 18: Landscape Typology of Sparrow's Nest (Espinoza, 2018)

Sustainable urbanism principles played a role at the town scale because, at this scale, the urban forms are designed like how many neighborhoods the town has and the size of the town center. Sustainable

urbanism principles influenced the land-use and zoning of the town. For

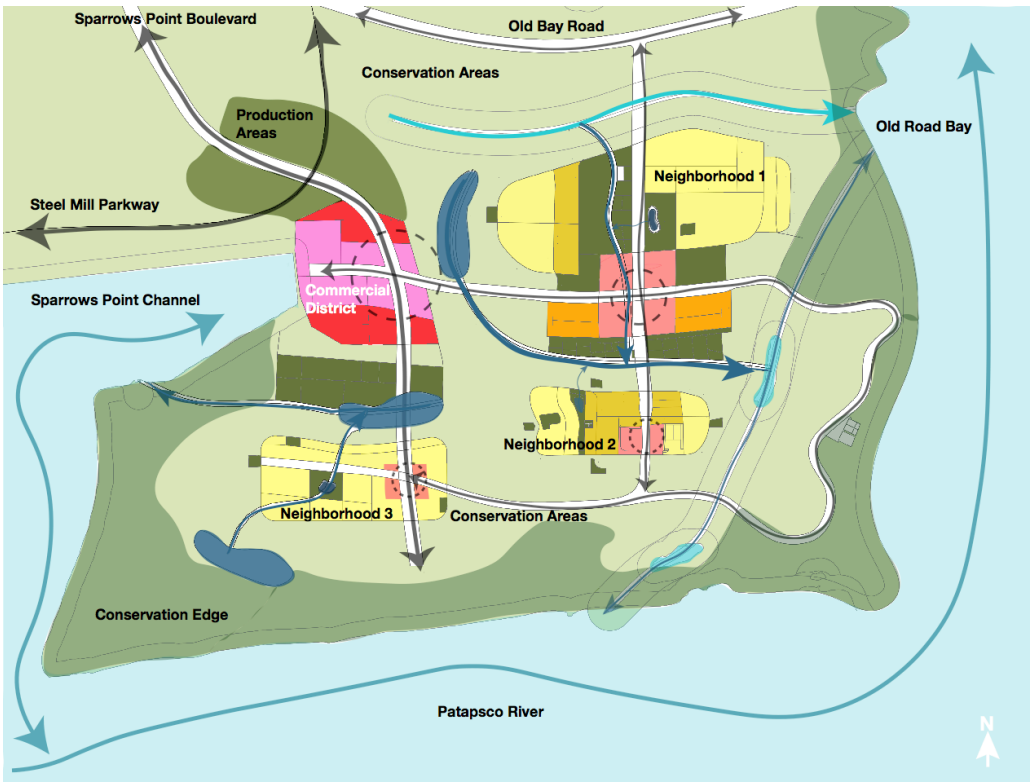

Figure 19: Land-Use map of the Town (Espinoza, 2018)

example, each neighborhood will have neighborhood retail and mix housing stock seen in Figure 19: Land-Use Map of the Town. Additionally, the plan will include a commercial district with mixed-use development. The Commercial District connects to the water's edge with access to the water. The district can have a small harbor with a water taxi that can take people to Baltimore City. Lastly, the design plans for different modes of transportation, such as a BRT Line, automobile connections, and trails. The different transit modes will interconnect the town center, neighborhoods, and ecological landscapes.

5.4: Sparrow's Nest Neighborhood Plan

The design at the neighborhood scale is located within the Sparrows Nest development area. It explores the translation of Landscape, Ecological, and Sustainable Urbanism principles in practice. The neighborhood design was positioned at this location because it has all the constraints needed to test the theories.

5.4.1: From Design Criteria to Application

A different criteria was developed for the Neighborhood design of Sparrows Nest. The Neighborhood Scale Design Criteria is more detailed than the criteria used to design the Master Plan and the Town of Sparrow's Nest. As before, the final design needed to fulfill each item in the criteria. The Neighborhood Design Criteria has three items these are (Restore and Reclaim Drosscapes into dynamic landscapes, create landscapes infrastructure, restore ecological services, and rebuild lost ecological and social communities) explained below and how to apply it to the site design at this scale.

Restore and Reclaim Drosscapes into dynamic landscapes:

At the neighborhood scale, drosscapes are minimized by reclaiming these spaces into functional areas that serve both humans and the ecology. The final design plans for leftover spaces and makes them part of the design. Therefore, spaces between neighborhoods and any voided space will be designed into community parks, active fields, nurseries, and stormwater

Landscape Typology	**Community Open spaces**	**Ecological Landscapes**	**Blue and Green Infrastructures**	**Working and Productive landscapes**
Typology Definitions	Recreation and social spaces	Environmentally benedictional landscapes Forest Meadows	Functional landscapes that capture and treat stormwater and clean the air	Landscapes that grow food and energy
Type of Landscapes	Regional Parks Trails/ Greenways Plazas Playgrounds Neighborhood parks Sports fields Urban gardens Cemeteries	Nature Parks Reforestation areas River networks	Large lakes Small retention pond networks Swales Infiltration meadows Green buffers Carbon forest	Research Education Urban farm Hydroponics Energy field Forest

Figure 20: Landscape Classification (Espinoza, 2018)

treatment areas seen in Figure 20: Landscape Classification. Also, these spaces can become densely, forested areas that will create more habitats.

Create Landscape Infrastructure:

To create balanced landscape infrastructure, five items need to be considered per the design criteria. At the Neighborhood Scale, Sparrows Point history will be revived and included by using materials and architectural styles that mimic the company town. A quick graphic study of how blocks and different architectural styles which resulted in picking the different kinds of architectural elements needed. It was discovered that keeping buildings at three stories and using materials like brick, wood, and steel would provide that old town feel. Also, to restore lost ecological services by adding different kinds of ecosystems, such as forested, grasslands, and freshwater systems.

Sparrow's Nest Neighborhoods are placed to avoid sea-level rise projections and other climatic issues by buffering the neighborhoods with forested areas and streams. The development areas avoid the shoreline. Additionally, the final design features hybrid fields that can adapt over time as the site is cleaned from toxins. These flexible spaces can change; for example, active fields can become community gardens and playgrounds. Designing fixable spaces allows the design to adapt to changing demographics and trends. Lastly, natural areas will self-organization and never be hidden. Urban areas will have more utilities and infrastructure but should still include green infrastructure and should be mindful of existing natural areas. Engineered spaces and natural areas on the site should coexist together without causing conflict.

Rebuild lost ecological and social communities:

In order to rebuild ecological and social communities, systems need repairing and improvements like naturalizing the shoreline and adding forested areas. These areas should include active and passive spaces that will maintain social interaction in these areas. The site plan included more forested areas with some meadows.

In urban areas, including more green spaces that can serve as forested areas and community amenities is essential. Additionally, these areas will have interconnected trails that will weave into natural and urban areas that can be used for leisure or walking to work. So, the new design will provide various forms of transportation trails like biking, walking, and electric

scooters. This is how ecological and social communities are balanced within the neighborhood design of Sparrows Point.

5.4.2: Sparrow's Nest Neighborhood Design

The resulting plan for the Neighborhoods of Sparrow's Nest is a compact development that conserves the shoreline. It enhances the existing channelized stream by naturalizing it and adding a 150 feet riparian buffer. Additionally, it includes a new stormwater treatment train in the design. A series of wetlands and streams will flow into the Patapsco River and Old Road Bay that will have trials and passive recreational opportunities for residents. By allowing the existing landscape forms and infrastructure to inform the design response, the design aims to balance the needs of people and ecology. Moreover, by designing urban areas compactly, more ecological areas can be added, which will minimize the impact on the environment; see Figure 21: Neighborhood Scale Design. Sparrows Nest neighborhood will wave together the urban form and the landscape while providing ecological opportunities and enhancements. Additionally, each community will have parklands and a system of trails that will connect all of the community members with ecological areas, which will bridge the gap between people and the ecological area. On the one hand, by allowing these landscapes to become functional ecological corridors that provide habitat opportunities and that are self-organizing landscapes. On the other, these landscapes can serve the community by providing passive and active areas where people cannot only connect with nature but play sports.

Figure 21: Neighborhood Scale Design (Espinoza, 2018)

Additionally, the sustainable urbanism framework aided with the neighborhoods. The design features a compact development approach and will have different housing stock available like single-family, townhouses, and duplexes. The neighborhoods will have a town core that will have retail shops with walkup apartments. Designing a retail core with medical offices, restaurants and clothing boutiques allows residents to walk or bike to nearby shop.

A gradient of the system was developed to aid in the design of the neighborhoods seen in Figure 23: Systems, which divides systems into three categories that are Urban, Landscapes, and Hydro. These systems were analyzed from the macro-level down to a minor system. Also, this table was used to understand how systems interact with each and change across

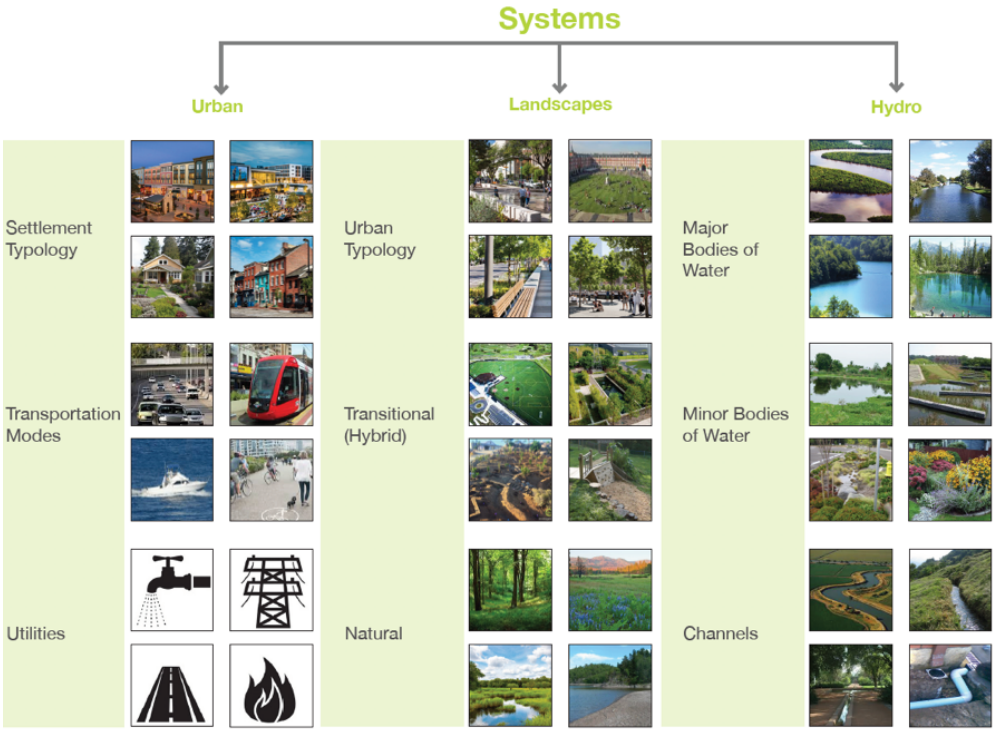

Figure 23: Systems (Espinoza, 2018)

scales. The creation of the different systems was inspired by the hydrological systems and how water naturally moves through the landscape from one body of water to the next. For example, how canals help water move to minor bodies of water that move it to major bodies of water such as oceans. The table was useful when thinking about urban conditions and how settlement typologies impact different transportation modes, which leads to the kinds of utilities needed for further developments based on the size of the development.

At the neighborhood scale, understanding and exploring the different systems at play within the urban and ecological environment is important. Here, ecological urbanism plays an essential role because it makes us understand all the services, systems, and needs that both humans and the ecological environments require. Figure 24: Interconnected Site Systems display the different systems within the neighborhood plan, which are broken down by ecological systems and human systems. Each layer represents a

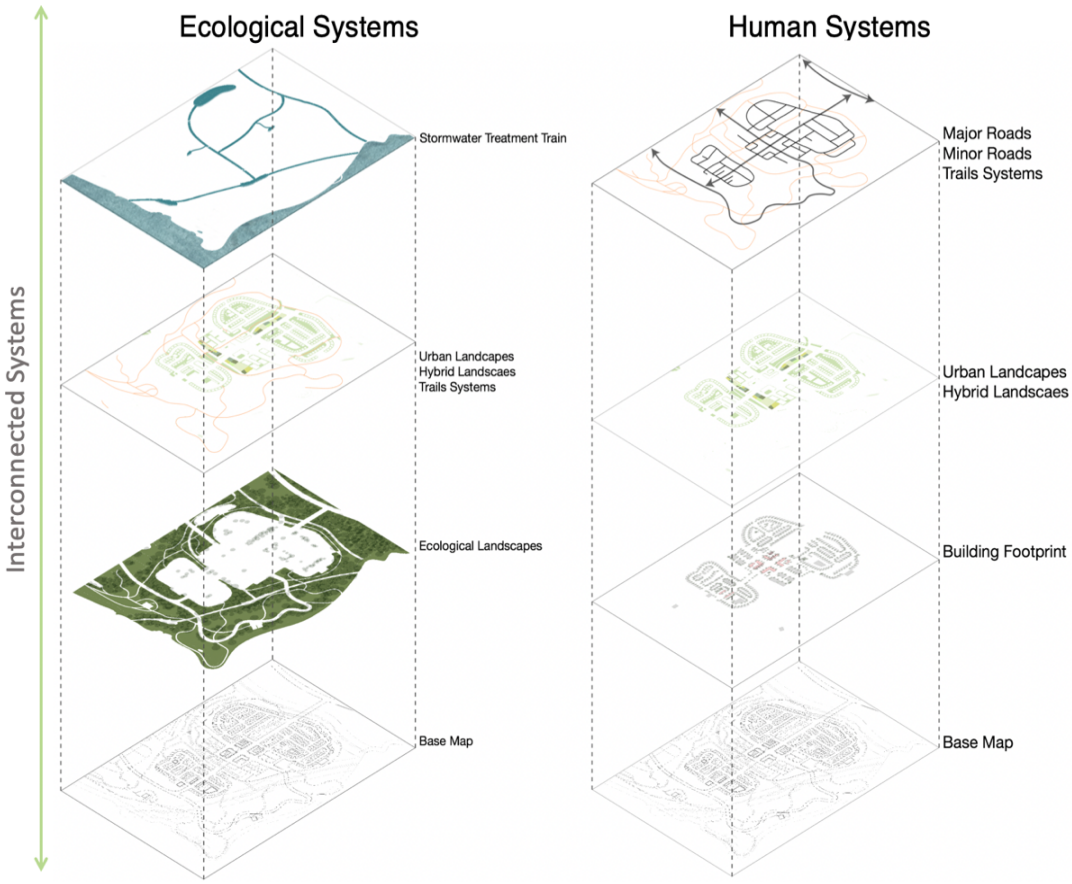

Figure 24: Interconnected Site Systems (Espinoza, 2018)

different system and how they are all interconnected to create a balanced landscape, where people's needs, and services are balanced with the ecological systems.

Additionally, the urbanist must note that everything is interconnected to each other by using this logic, a gradient of systems is introduced, which can be applied to the design of the neighborhood in Sparrows Nest. Figure 25: System Gradient, shows a section of the site plan from south to north layered with the landscape gradient and stormwater movement. Additionally, this figure depicts how there will be more trees in natural areas, and water will move freely, unlike the urban areas where stormwater is controlled. In urban

environments, the landscapes will be very structured, and all stormwater will be collected underground.

Figure 25: System Gradient (Espinoza,2018)

5.4.3: Population Density

The Design of Sparrows Nest Neighborhood features a Traditional Neighborhood Design (TND) over the conventional suburbs model that was derived from the Sustainable Urbanism Neighborhood Unit Model. TND communities provide opportunities for residents to walk to shopping stores and entertainment areas by implementing a retail center. TND's retail centers are risky to developers because retailers must respond to the changes in consumer demands and trends. Nonetheless, TND community retail directly impacts the surrounding residential population, therefore, having useful retails such as coffee shops, cafes, and food markets can help improve and contribute to the quality of life within a neighborhood (Farr, 2007).

Neighborhood retail can be broken down into three types: Corner Stores, Convenience Centers, and Neighborhood Centers. Corner Stores are considered the most useful retail type and can range between 1,500 to 3,000 square feet (Farr, 2007). Densely populated TND communities can support a corner store within a neighborhood especially if it is adjacent to community buildings and schools. Usually, to support a corner store a community needs one thousand households and it needs to be within a five-minute walk from residents. However, corner stores that include a gasoline station can support themselves (Farr, 2007).

Convenience Centers are typically 10,000 and 30,000 square feet, and they offer a variety of goods to a community such as specialty food markets or pharmacies. Typically, convenience centers have five to eight different small businesses which are located within walkable distances to the community members. These centers need about two thousand households or two TND neighborhoods to support the retail as well as placing them along major roads (Farr, 2007).

Neighborhood Centers generally are arched with supermarkets, pharmacies, restaurants and video stores. These centers offer a full range of services and range between 60,000 to 80,000 square feet and usually require 6 to 10 acres of property (Farr, 2007). As well as 6,000 to 8,000 households to support the retail (Farr, 2007). In the next section, the neighborhood design of Sparrows Nest will be discussed further and the relationship between dwelling density to retail space. Figure 25: Sparrows Nest Urban

Areas shows the number of acres in the whole town as well as the neighborhood acres which is 234.33 this includes all-natural areas, parks, and riparian areas. Therefore, the total urban areas will be 119.65 acres which are slightly lower than the preferable area of a neighborhood within the sustainable urbanism framework which is 160 acres. However, to prioritize the conservation areas the urban parts had to be reduced. As well this helps to conserve the town like feeling within the neighborhood. Sparrows Nest Neighborhood will have a total of 768 units which will include 254 single family dwellings, 144 townhouses and 350 apartment dwellings with a town center. The Town Center will have 870 square feet of retail space and 280 square feet of neighborhood retail nested within neighborhood two. This equals a total 1,150 square feet of retail within the neighborhood.

Sparrows Nest Town	
Total Town	**~529.57 Ac**
Total Neighborhood	**~234.33 Ac**
Total Urban Areas	**~119.65 Ac**

Figure 26:Sparrows Nest Urban Areas (Espinoza, 2018)

Although, the Sustainable Urbanism framework calls for more dwellings for retail to be supported. It is important to note that studies show Americans consume more and need more retail space. Gruen Gruen Associates (2005) Land Use/Public Policy Analysts show that in 2009, the estimated retail demand and supportable retail space for a resident in America was 2,655,00 square feet. This is based on total household income

of Americans and their potential purchasing power. Gruen Gruen Associates (2005), the study also concludes that neighborhood Shopping Centers are 58,840 square feet, and community shopping centers are 215,753 square feet with an average sales per square foot being $314 and $286. Therefore, the designed retail space within Sparrows Nest Neighborhood can be supported based on the consumer trends of Americans. Additionally, the town center and neighborhood retail are programmed to be fixable spaces that change over time and adapt to the needs of the community.

5.4.4: Transit Supportive Densities

The Design of Sparrows Nest Neighborhood features a BRT line that connects all three neighborhoods and the commercial district. The line will also run through the ecological areas as seen in Figure 26: Sparrows Neighborhood Modes of Transit. The BRT line will help connect and give community members access to the ecological areas as well. Within the Sustainable Urbanism agenda, the relationship between population density and transit is essential. In particular, its ability to support

Figure 27; Sparrow's Neighborhood Modes of Transit (Espinoza, 2018)

the transit line is important. A rapid system is supported by 12 dwelling units per acre which the final design of Sparrow's Nest neighborhood design does meet this requirement (Farr, 2012). Additionally, the rapid system will be supported because the line will connect to a commercial district or downtown. This line can also unit all of the development areas within all of Sparrows Point.

5.4.5: Designing Through the Landscape

Urban Landscapes Figure 27:

The design exploration starts in the urban environment. Here both the landscape and water movement are structured. In this plaza design, the landscape is layered and buffers the street and buildings while cleaning the stormwater before it reaches areas where residents can play with the water and by strategically placing trees to provide shade and a relaxing effect. The hydro systems will move not only above-ground but through pipes and cisterns underground. This will create an interconnected cycle between the plants and how the water moves. The stormwater will also move through the landscape from planter to two planter bogs and move to the middle where the water will be rippled to allow it to oxidize naturally. Here children can play with the water, or a person can sit on one of the raised planter beds and reflect on life. As well as walk by and feel calmed because of the layered plants and activities happening in the plaza. Additionally, by applying Landscape urbanism principles, dynamic landscapes are created that are functional, thus

breaking from the transitional urban landscape typology that is static and stroke.

Hybrid Field Landscapes Figure 28:

The hybrid fields landscapes intermix agriculture with active fields like a football field and unprogrammed spaces for community gatherings. Since Sparrows Point is very contaminated, planting food is not healthy nor recommended. Therefore, the agriculture fields are nurseries that will provide plants and street trees for the town of Sparrows Nest. By designing these transitional landscapes as flexible fields, will allow for them to change with the community's needs. Ideally, the hybrid fields are designed to provide recreational opportunities to the residents because they can walk down from their homes or the town center along the trails and use this landscape. Additionally, the stream is part of a treatment train that will help clean stormwater throughout the entire neighborhood. Here the stream serves double duty. It not only moves water, but the residents can walk up or along the water's edge, creating a biophilic connection to nature. The settlement areas will reflect and use the historical pass by using the building typology found in Sparrows Point town.

Hybrid Natural Landscapes Figure 29:

Hybrid Natural Landscapes will allow residents to enjoy a semi-natural environment. In this landscape, the natural systems began to take over and residents can still use the area. Here the landscape is designed to organize more organically and tapers down to allow the phytoremediation process to

occur that will allow clean water to flow down to the stream. The edges of the stream will be stabilized by adding plantings along the edge.

Additionally, to balance both people and ecological usage, the stream is designed to allow people to walk up and enjoy the water's edge. Also, people can use the base of the terrace for recreational activities such as panic areas and play sports. They can also walk up along the first terraces for a more passive experience. Since the neighborhood design features a network of trails, residents can walk down from their homes and take advantage of this landscape's passive, active areas as well as scenic opportunities. The Hybrid Natural Landscape is a perfect example of how to balance all systems into both functional and productive landscapes for all users.

Production Landscapes Figure 30:

The shoreline along Patapsco River is designed as a production landscape. On the one hand, the landscape will create habitats, stabilize the edge, and harvest energy through windmills. On the other, it will treat stormwater and provide research and educational opportunities. The edge will be stabilized by introducing and allowing dunes to form. Placing the dunes at an appropriate distance from the shoreline will account for wave fetch or the wave energy produced by the Patapsco River. Understanding wave fetch is important because if dunes are designed to close to where waves are breaking, plants will not thrive or survive. However, the edge is not designed to be an armored edge but a living shore that will have dunes. People can

walk through the dunes and learn about them or walk up to the research facility where they can learn about wind harvesting, stormwater management, habitat stabilization. Lastly, they can learn about sea-level rise and how the Sparrows Nest Town is designed to be protected.

The production landscape type balances how people can use the space while allowing and giving nature what it needs to be a functional landscape that can create habitat opportunities and protect the edge. Moreover, people will get the opportunity to learn about feature impacts on Sparrows Point while providing a scenic trail that they can use not only to connect to nature but to learn about the landscape infrastructure and how it is being designed to help future impacts.

Natural Landscapes Figure 31:

The last landscape typology explored are Natural Landscapes. In this landscape typology nature is allowed to self-organize, and ecology is the priority. Wetlands are allowed to form, and there are different kinds of habitat, such as forest and meadows. Ideally, this area will be protected and allowed to mature over time so that the Landscape can naturally function.

Additionally, humans are allowed to use these spaces; however, there will only be passive recreational areas. Meaning that there will be no programmed spaces for human activities; even the trail will fade away in these areas and be less structured because ecology is the primary concern of the Landscape Urbanist. Natural Landscapes are important because they provide the maximum amount of ecological services within an area. Where

the other landscapes balance both human and ecological services in this landscape design ecology is emphasized and highlighted.

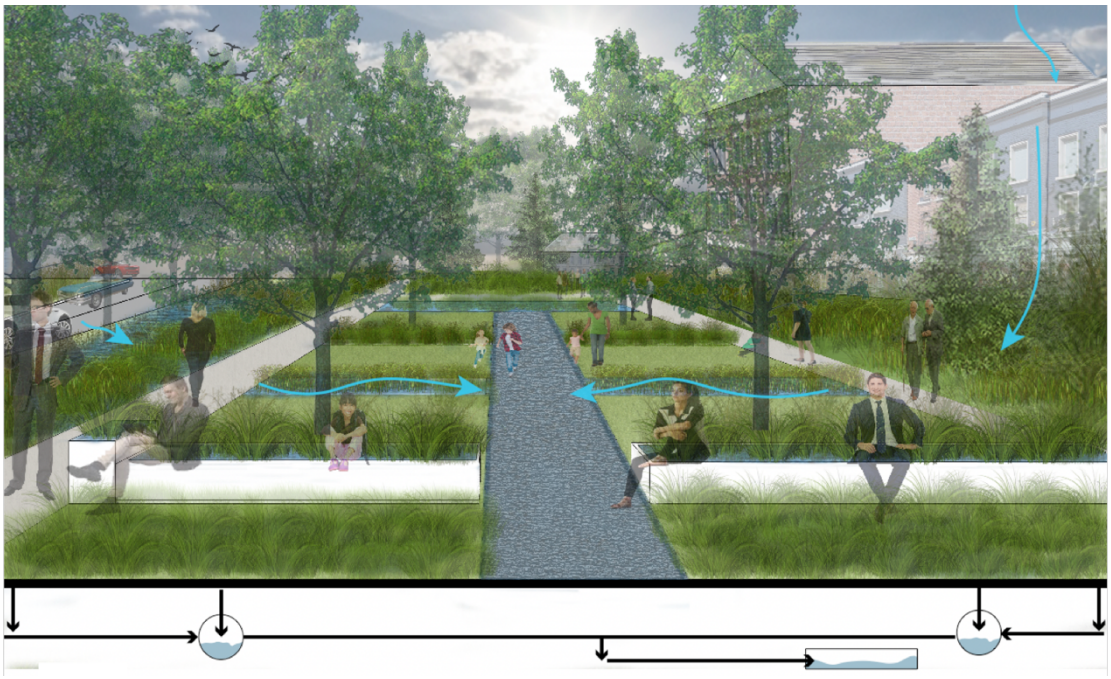

Figure 29: Urban Landscapes (Espinoza, 2018)

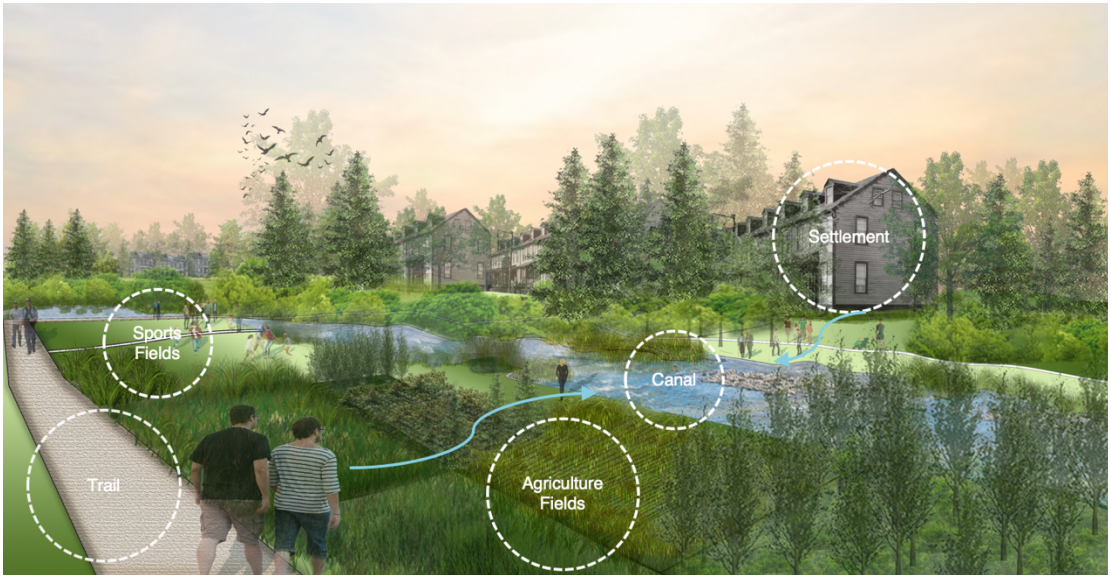

Figure 28: Hybrid Fields Landscape (Espinoza, 2018)

Figure 30: Hybrid Natural Landscapes (Espinoza, 2018)

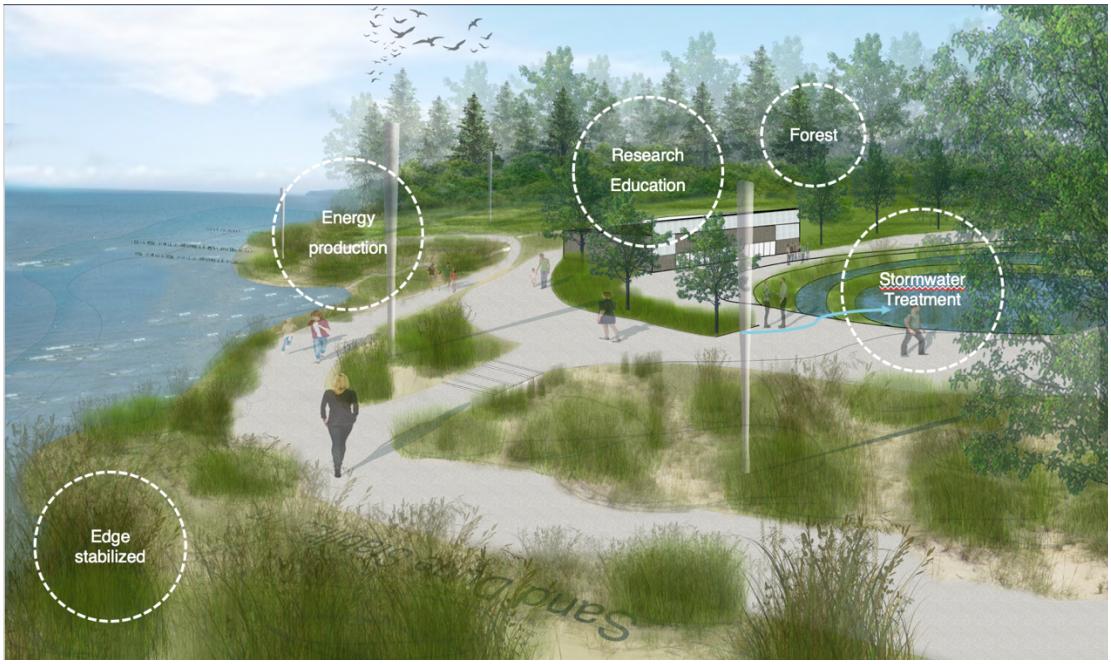

Figure 31: Production Landscape (Espinoza, 2018)

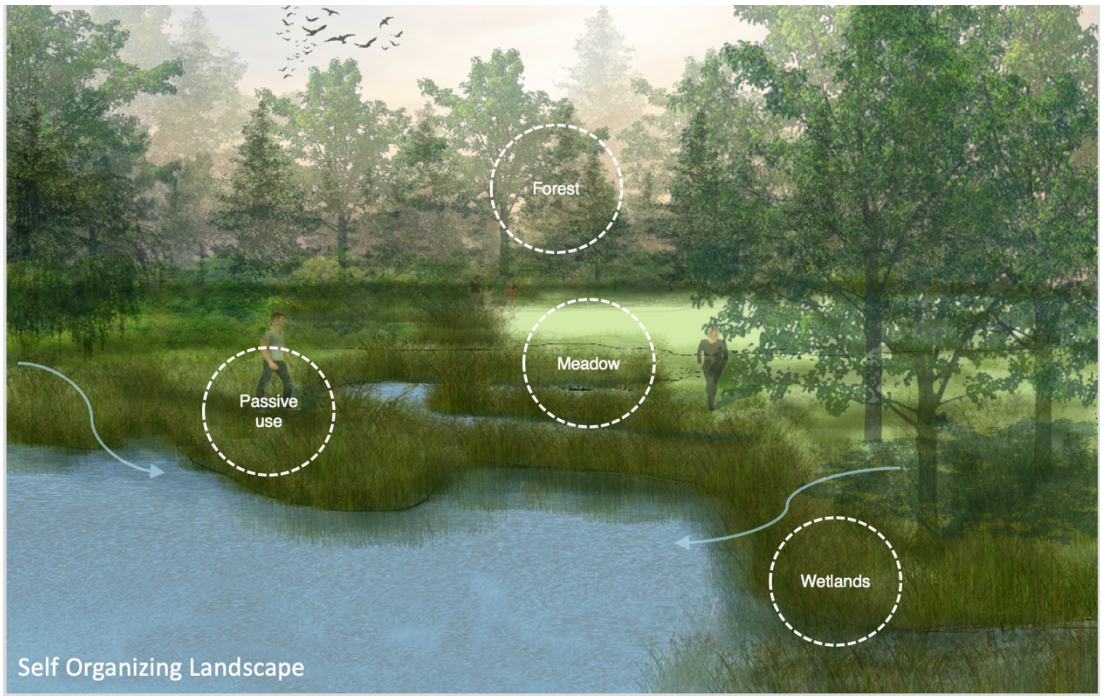

Figure 32: Natural Landscape (Espinoza, 2018)

Chapter 6: Reflection

The practice of Landscape Urbanism has many challenges, shortcomings, and benefits resulting in some rewarding outcomes to both urban design and landscape architecture practice for this thesis project. While Landscape Urbanism presents many promises on how the urban environment should be treated, planned, and designed, the theory does not introduce any straightforward guidelines or practice policies that apply the theory to site design. Therefore, the first step of this thesis was to become familiar with what Landscape Urbanism is and to understand the boundaries. From the

literature review process, a design criterion was created that would aid in both the site selection and design process.

Initially, it was challenging to design and dissect the Landscape Urbanism theory into a workable framework. The framework was abstract, making it difficult to apply in any design process. This resulted in breaking the theory down into three themes: Landscapes of Infrastructure, Terra Fluxus, and Drosscape. In the end, Terra Fluxus and Landscapes of Infrastructure principles played a significant role in the design outcome.

At the Master Plan Scale, the Landscape Urbanism discourse and three themes were easily applied to the design process because the ideas found in theory were more overarching or big picture concepts. For example, at the master plan scale, the Landscape Urbanism discourse exposes sensitive ecological areas and corridors and tells us to protect and conserve these areas by zoning them into conservation areas. Allowing these areas to function and carry out their natural process, is one of the Terra Fluxus principles.

Nevertheless, including other urban and landscape theory at the site-scale was needed because Landscape Urbanism theory was not sufficient. The other urbanism theories explored for the site-scale were Ecological Urbanism and Sustainable Urbanism. For instance, when designing towns and communities, it was challenging to rely solely on Landscape Urbanism theory principles because the theory falls short on urban form and design strategies as well as recommendations.

When designing through the lens of Landscape Urbanism, it was challenging to create a design at multiple scales. And the theoretical framework left us with many questions that need answers. These questions were:

- How could Landscape Urbanism principles be applied at the regional scale compared to the neighborhood scale?
- How could the theory be applied to a specific site-scale design if there are gaps in the theory?
- Moreover, how do we apply the theory in practice? If there are no practice guidelines.

The solution was to apply the overarching theoretical principles of Landscape Urbanism to the master planning scale and supplement the gaps in the Landscape Urbanism discourse with sustainable and ecological urbanism theory for the site-scale.

6.1: Master Plan

When developing the master plan design of Sparrows Point, the Landscape Urbanism theory themes were further examined and broken down to create two criteria that would aid in the design. The theory tells us that understanding the site constraints as well as cultural elements, is extremely important.

Six different areas were identified on the site and zoned; according to the areas past, present, and future use. After conducting the suitability analysis, the site zones were classified as either an ecological zone (conservation area) or a mixed area having both ecological areas and human

development. Future sea-level rise projections played a crucial role in establishing the zoning of an area because, under the Landscape Urbanism discourse, these areas are sensitive areas that become conservation areas with limited human development. Past use is another factor that played a fundamental role in the zoning of the site. For example, developing the two landfills on the site would not be recommended even if they are waterfront properties; instead, they become forested park areas. The suitability analysis also led to the overall design of the master plan because it identified suitable areas for development.

The master plan connects to existing road infrastructure; it creates a new network of roads with a circulating parkway and a prominent boulevard cutting through the site from northwest to southeast. The master plan also protects the shoreline and creates biological networks. Additionally, these fixed parameters of road infrastructure, shoreline, and biological networks help identify the human development areas. Conducting a suitability analysis is the most important because the Landscape Urbanism discourse advises the urbanist to consider the land and ecological forms first and then the urban forms. This simple action allows the landscape to become a medium versus an afterthought. Compared to how urban developments were created in the past where prioritizing the human needs are more important. Engaging the site's cultural ties by naming streets and towns after its historical past applies another landscape of infrastructure principle.

Applying Landscape Urbanism principles at the master planning scale proved to be straightforward because the framework provides an understandable design logic that instructs both design and planning practitioners to consider the landscape, ecological patterns, and constraints of that landscape before developing an area. Additionally, it commands that the practitioner consider all cultural ties and revive them when they are lost. In this way, the theory is very relevant to the design and planning of regional areas.

6.2: Neighborhood Plan

Compared to the master planning scale, designing at the neighborhood scale proved to be difficult using only the Landscape Urbanism theory lens. After understanding and locating the ecological and development areas, there were still unanswered questions such as:

- Where do we go from here, what is next?
- How do we plan or design these areas?
- What characters and identities will these communities have?
- What guidelines or tools does Landscape Urbanism provide?

The short answer is none. Landscape Urbanism promises so much but delivers very little in the site-specific practice realm. Exploring Sustainable and Ecological Urbanism was essential to move forward with the site-specific design, and it was concluded that these theories enforce the Landscape Urbanism discussion. They provide a practicable toolset that can be easily

applied to neighborhood design and fit under the Landscape Urbanism framework.

Sustainable Urbanism theory aided the design logic by giving a tangible toolset of the ideal urban form and design. It provided an agenda on how communities should be designed and laid out by having an interconnected community that is walkable and has transit options. The theory also protects ecological areas but focuses on the application of how to design a neighborhood that will survive time and future economic changes as well as the needs of residents. The neighborhood design will feature a community core that will have neighborhood-specific retail and a school within each community — connecting all systems with ecological areas, trails, and road systems. The cultural and ecological Landscape Urban principles were applied by introducing buildings that resemble the existing communities of Sparrows Point. The communities will also include various parks within the communities and ecological areas that the community can use.

At this scale, understanding the different ecological systems that shape a site and how they impact a design becomes important. Essential questions to answer under the Ecological Urbanism Lens were what the human and environmental systems are? Where do they connect? Where do they differ? It created a gradient of systems within the urban, landscape, and hydrologic environments. Translating this to the design of the neighborhood scale was a more straightforward task by understanding the difference between urban landscapes and natural landscapes and the needs each landscape has. For

example, water will move differently in urban areas (bio-swales and pipes) than in the natural areas (natural infiltration). However, this was derived from the ecological theory, while the Landscape discourse states the urbanist must design with the landscape but never tells us how.

Even though at the neighborhood design scale Landscape Urbanism is challenging to apply. It still provides a strong base to start any design logic from both landscape architecture and planning ideology. If more practitioners allowed both the landscape form and ecological needs to inform urban development, we would have more sustainable communities that would naturally protect themselves from natural forces.

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