ENVISIONING FUTURES FOR MAYPORT, FLORIDA THROUGH COMMUNITY-DRIVEN DESIGN ALTERNATIVES

by

RACHEL DINGLEY

(Under the Direction of JON CALABRIA)

ABSTRACT

Mayport, Florida, a historic fishing village, working waterfront and home to Naval Station Mayport, faces the critical need for strategies to enhance the long-term resiliency of its community, infrastructure and shoreline. The objective of this thesis is to generate design alternatives based on community feedback and conduct an alternatives analysis to select a preferred option. This alternative will guide future co-design sessions with the Mayport, Florida, community, aiming to improve their shoreline and accommodate transportation at the 'Little Jetties' through Nature-based Solutions (NbS). This objective will be achieved by first exploring alternative participatory frameworks, then incorporating preliminary inventory and community feedback data to develop six design alternatives. These alternatives will provide materials for future co-design phases, demonstrating how the preferred option best responds to site conditions and community feedback. This process will support the co-creation of meaningful, resilient and adaptive design solutions with the Mayport community.

KEYWORDS: alternatives analysis, Nature-based Solutions (NbS), participatory frameworks, resilience planning, shoreline enhancement

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RACHEL DINGLEY

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by

RACHEL DINGLEY

Major Professor: Jon Calabria
Committee: Katherine Melcher
Ben Carswell
Kelsey Broich

Electronic Version Approved:

Ron Walcott Vice Provost for Graduate Education and Dean of the Graduate School
The University of Georgia
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DEDICATION

Hope then to belong to your place by your own knowledge

Of what it is that no other place is, and by

Your caring for it as you care for no other place, this

Place that you belong to though it is not yours,

For it was from the beginning and will be to the end.

-Wendell Berry (A Poem on Hope, 2013)

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CHAPTER 1

INTRODUCTION

Mayport, situated at the mouth of the St. John's River, is home to the third-largest United States Naval base and a well-established maritime community (Navy Region Southeast, 2024). For generations, Mayport's cultural and traditional knowledge has been deeply rooted in fishing, shrimping and other trades shaped by the river and its coastal proximity (NAVFAC, 2024). The United States government, in partnership with defense communities and other organizations, has recognized the importance of strengthening coastal areas that contain military installations and adjacent defense communities (DCIP, 2024). Public input is critical in these efforts, as military installations and surrounding areas share critical assets and infrastructure essential to both defense operations and local livelihoods (King et al., 2022).

This project explores a community-informed design process to address these challenges by gathering local opinions, assessing at-risk sites along coastal highway A1A and designing recommendations that respond to existing and future issues. As part of a broader, ongoing project led by the Carl Vinson Institute of Government in partnership with the National Fish and Wildlife Foundation and other collaborators, this project seeks to more directly address the most critical areas of concern, particularly the stretch of shoreline along A1A that leaves the Naval Station Mayport gate exposed and increasingly vulnerable. This thesis expands beyond the ongoing project's defined area of interest by including a longer portion of A1A and incorporating Helen Cooper Floyd Park. This broader scope supports a systems-based approach, offering a more comprehensive range of potential solutions that focus on natural infrastructure for shoreline enhancement and visitor programming.

This project investigated public engagement frameworks, starting with foundational models such as Arnstein's Ladder of Participation (Arnstein, 1969) and the International Association for Public Participation (IAP2) (IAP2, 2024). Engagement models will be evaluated to compare the strengths and weaknesses of similarly structured frameworks, starting with Arnstein's and moving to more recent approaches. The evaluation will focus on their ability to support true autonomy and representation, helping to select a preferred framework for guiding future co-design opportunities. Design alternatives will be developed with this future application in mind, ensuring they are communicated in an accessible manner to align with the chosen participatory framework to inspire future public engagement. The more relevant the framework, the more cohesive the design of future co-design sessions will be.

While this thesis will not implement co-design session with the Mayport community, it will lay the groundwork for future applications and provide design alternatives for consideration. The design alternatives generated through this project are intended to be revisited as needed to help guide later stages of design and inform collaborative sessions moving forward. By synthesizing relevant data, identifying community priorities and proposing actionable design recommendations, the research addresses the question: *How do design alternatives, based on community input, contribute to potential future co-design opportunities with the Mayport, Florida community that respond to environmental conditions and community priorities?*

The thesis entails five chapters. Chapter one includes an introduction, providing an overview of the thesis and introducing key objectives. The second chapter includes a literature review and will provide site context before exploring five participatory frameworks to guide design alternatives and materials for future use with the Mayport community. The third chapter, Methodology, provides an analysis of potential risks and constraints affecting the site through site inventory data and mapping. Chapter three will then summarize community input results, synthesizing community perspectives and priorities for incorporation into the design alternatives. The fourth chapter, Results, provides descriptions for each of the six proposed design alternatives tailored to address previously identified challenges and feedback. The fifth chapter will include discussion comparing designs through an alternatives analysis, further describing each design before highlighting their strengths and weaknesses. The discussion will lastly recommend a preferred alternative and detail how the materials can inform and be incorporated into future co-design opportunities with the Mayport community.

CHAPTER 2

LITERATURE REVIEW

History of Mayport

Understanding the historical narrative of Mayport through time provides the context needed to intentionally guide its future development. Since its establishment in 1562 by French Huguenot Commadore Jean Ribault and his crew (Navy Region Southeast, 2024), the area east downtown Jacksonville, Florida, now known as Mayport has grown in population and size, supporting the third largest United States Naval base and an active working coastal community (NAVFAC, 2024).

When Ribault first landed along the Atlantic shore near present-day Jacksonville, he was met with the Timucua indigenous population (Gold, 1928). Some of the earliest accounts recorded in this area are interactions with chief Saturiwa, whose village is speculated to have been in Mayport (DeCoster, 2013). Influencing landscape, history and culture, the St. John's river has played a significant role in the development of Mayport and has been known by many names: Welaka by indigenous peoples (SJRWMD, 2024), Rio de Corrientes (river of currents) by the Spanish in the early 1500's (Corse, 1942), Riviere de Mai (River of May) by the French in 1562 who settled Fort Caroline and was later named Rio de San Juan after a Spanish mission named San Juan del Puerto (Lowery, 1850). The English translation *St. John's River* derives from this name and remains the name of the influential river to this day.

Spain controlled Florida until 1763, when England gained jurisdiction. During this time, King George III commissioned botanist John Bartram to explore Florida. In William Bartram's 1791 published work, he describes his exploration of the river as far south as Lake Harney (Bartram & Harper, 1998). Following the American Revolution, Florida was returned to Spanish control and remained a Spanish territory until it was ceded to the United States in 1820 (Abbey, 1929).

The first instances of the Unites States military occupying the area of Mayport and lands along the St. John's River are during the Civil War. A Confederate unit, the Jacksonville Light Infantry, and similar infantry companies established themselves where Mayport Naval Station is currently located in attempts to defend and hold the St. John's River (Nulty, 1993). However, being outnumbered by Union troops, the men surrendered in May of 1862 (Proctor, 1963).

During the 19th century, Mayport underwent a shift in economics and the community. Prior to the Civil War, the main local economy of Mayport included boat piloting and fishing (Fretwell, 1988). Due to this, the transport of lumber became a foundational part of the local economy (Davis, 1936). Following the Civil War, the lumber industry remained a key part of Mayport's economy along with trade and tourism (Doherty, 1980). Supported by the extension of rail lines in northeast Florida, coal, lumber and other goods could be transported and loaded directly by docks along the St. John's River (Doherty, 1980).

Although a key access point to the St. John's River as a port of entry, Mayport and other regional towns were often hindered economically by the St. John's River bar. The shallow bar often delayed or kept out vessels. At other times, the sinuous nature of the channel caused groundings or shipwrecks (Buker, 1992). As a result, the second hydraulic hopper dredge in the United States, 'The Burden', was designed to remove sediment from the mouth of the river. By cutting the channel, access to the river became easier and steamboats began making weekly trips from Charleston and Savannah to Jacksonville and Palatka (SJRWMD, 2024).

As local trade and tourism thrived, land developers began to establish beach areas such as Burnside, Seminole and Manhattan Beaches (Gold, 1928). Water and rail transportation made accessing the new tourist destinations possible and hotels began to populate the landscape as a result. The Jacksonville and more specifically the Mayport area, continued to grow by means of the Florida East Coast Railways until the early 1930's when the trains stopped running and the Mayport community returned to fishing and shrimping (Doherty, 1980). In the early 1940's, Naval Station Mayport was founded and has since been an integral part of the Mayport community (NAVFAC, 2024).

The Beginnings of the Base

The area that now serves as Naval Station Mayport is located within the Jacksonville, Florida city limits, 12 miles northeast of downtown Jacksonville. In the early 20th century, the area that is presently the Mayport Naval Station, was a collection of residential areas near the St. John River, summer vacation homes and rental cottages (Navy Region Southeast, 2024). At the time, the area lacked jetties and remained wooded in several areas (Rawls, 1952). Not long after the trains stopped running to Mayport, the town returned to its working waterfront roots and the area was sought out as the site for a new southeastern naval air base (Doherty, 1980).

In May of 1938, the Honorable Claude Swanson appointed a board led by Rear Adm. A. J. Helpburn to locate the ideal area for the future station (Navy Region Southeast, 2024). On December 27, 1938 the board recommended Jacksonville as an ideal location for the future installation based on its ability to support facilities for two carrier groups, three patrol squadrons, two utility squadrons, complete plane and engine overhaul, berthing for carriers at inner end of entrance jetty, a channel to permit tender berthing at piers and development of an outlying patrol plane operating area in the lower "Banana River" (NAVFAC, 2024).

The origin of the station is deeply tied to the citizens of Duvall County, Florida. In 1939, the citizens of Duvall promised the Navy Department they would buy the land for the main Naval Air Base and Carrier Berthing (Lepore, 2011). Upon passage of H.R. 2880, 76th Congress, 1st Session, which authorized the projects contained in House Document 65, the citizens of Duval County passed a $1,100,000 bond issue to purchase land for the two stations on July 18, 1939 (NAVFAC, 2024).

Since its official commission in 1942, the naval station at Mayport has grown to become the third largest naval fleet area in the United States (Daraskevich, 2017). By combining the land by the initial 1.1-million-dollar bond in 1939 with adjacent properties, the size of the bases at its commission was 700 acres (Gold, 1928). The expansion of the base has had profound implications for Mayport, reshaping both the physical landscape and the socio-economic dynamics of the region.

Cultural Heritage

Over the course of its history, Mayport has grown and developed under the jurisdiction of the French, the Spanish, the English, the Spanish once again and finally under the United States (Navy Region Southeast, 2024). Mayport's changing population contributed to the formation of the present-day community, shaping their history, landmarks, occupational communities, traditional knowledge, oral traditions and culture. In David Taylor's book, *Documenting Maritime Folklife: An Introductory Guide (1992)*, Taylor records his time with the community members of Mayport, Florida with the hopes of promoting a deeper understanding of maritime knowledge and cultural history. Culture, as expressed by Taylor:

> "...is a complex and ever-changing body of knowledge that provides rules, methods, beliefs for conducting life within families, communities and the various occupational, ethnic, religious, recreational and other human groups…" (Taylor, 1992).

Existing as a long-standing maritime community, the town of Mayport's cultural and traditional knowledge is heavily based on fishing, shrimping and other trades shaped by the St. John's River and its coastal proximity. The connection between human activity and the natural world is central to understanding Mayport's cultural heritage, as the livelihoods of its residents have historically been dependent on the river. The core idea of maritime culture is based on the belief that human behavior is significantly influenced by the natural environment (Taylor, 1992). The term maritime culture, a term to describe the Mayport community, is helpful because it refers to both the landscape and the human behaviors that arise due to environmental circumstances (Ounanian et al., 2021).

Culture can be expressed through the tangible and intangible (Cohen-Shacham et al., 2016). As Taylor expressed in his work, *tangible* cultural expressions could be tools, boats, lighthouses and other physical artifacts while *intangible* cultural expressions might include songs about fishing, local legends and lore, or locally derived navigation methods based on landmarks (Taylor, 1992). Preserving the Mayport community's tangible and intangible cultural expressions while maintaining working waterfront elements such as fishing will remain a core part of programming during the design process, ensuring this aspect of Mayport's history and culture is represented in its future landscape.

Nature-based Solutions

In the United States, coastal regions often contain outdated infrastructure or infrastructure in need of significant repair, making communities and their local economies increasingly vulnerable (Sutton-Grier et al., 2018). Florida, often seen as a focal point for climate change impacts in the U.S., faces considerable challenges due to its geography and the large number of people living in coastal areas. With more than 76% of its population residing along the coast, the state is particularly exposed to climate threats (Grosso, 2015). Since 1880, global mean sea levels have risen by 21 to 24 cm and are projected to rise anywhere from 0.3m to 2m depending on emissions levels, global temperature rise and which time interval is assessed (Parkinson & Wdowinski, 2023). By 2050, rising relative sea levels (RSL) will elevate tide and storm surge heights, altering flood patterns along U.S. coasts (Sweet et al., 2017). In Mayport, many of these issues are occurring at present. According to Mayport's Florida Bar Pilots Dock station sensor, this area has experienced 0.93 feet of sea level rise between 1928 and 2025 at a rate of 0.12 inches per year. In the Southeast, between 1993 and 2020, the region experienced 0.46 feet in sea level rise at a rate of 0.20 inches per year (NOAA 2025).

This national and global issue highlights both risks and opportunities. While aging infrastructure and limited past action have left coastal regions exposed, there is increasing recognition to rethink infrastructure planning (De Bruijne et al., 2010). One approach is to implement Nature-based Solutions (NbS). Nature-based Solutions (NbS) are actions that focus on protecting, sustaining and restoring ecosystems to address societal challenges (Sutton-Grier et al., 2018). This approach includes a variety of green or natural infrastructure practices that can be applied at different scales. NbS such as marsh creation and restoration, constructing living shorelines, or beach nourishment provide natural defenses against storms and erosion while enhancing ecological systems (Sutton-Grier et al., 2018).

By addressing these risks, communities can enhance their resilience to future threats, promote long-term ecosystem health and incorporate the co-benefits associated with NbS (Aghaloo et al., 2024). Essential infrastructure extends further than roads, bridges, pipes and other built environment components (B. M. Webb et al., 2019). Essential infrastructure influences health, safety and economic stability and includes the landscape and its ecosystems services (Baptist et al., 2021; IRIS, 2024). Dunes, marshes, wetlands and living shorelines are a few key examples of natural and nature-based infrastructure that expands beyond what is traditionally conceptualized as infrastructure (Holling, 1996).

The United States government in partnership with defense communities, areas that include military bases and the neighboring civilian communities, are turning their focus to strengthening coastal communities containing military installations, their adjacent defense communities and essential related assets (Herrera, 2020) (UGA-DCRP, 2024). Military installations are closely intertwined with defense communities in the surrounding areas, making public input essential when considering changes that affect both sectors (DCIP, 2024). Often, critical assets and infrastructure requiring protection are integral to defense operations and local communities (Herrera, 2020).

Mayport, home of Naval Station Mayport and Mayport Village, faces increasing threats from sea level rise, intensified storms, and shoreline erosion, calling for sustainable solutions that integrate natural processes with engineered interventions. NbS can provide adaptive approaches to mitigating inundation risk while enhancing shoreline stabilization by restoring natural coastal features rather than relying solely on traditional gray infrastructure (B. Webb et al., 2019).

Solutions considered for the project site at Mayport will include living shorelines, marsh creation and restoration, dune stabilization, breakwater oyster reef creation, and use of plants indigenous to the area to address issues such as coastal flooding, biodiversity loss, sediment loss and shoreline erosion to balance ecological and engineering elements for maximized functionality and overall co-benefits (Dunlop et al., 2023).

Determining the project scope is essential for a design project such as Mayport to interpret which interventions are the best fit. The scale, zone and target infrastructure type must be identified for shoreline stability and resilience planning (Debele et al., 2023). The target infrastructure interventions in the Mayport project are green to hybrid. Green infrastructure is a combination of natural and semi natural features included with other environmental features to provide ecosystem benefits (Holling, 1996). Hybrid infrastructure, however, incorporates both green and gray infrastructure elements, encompassing living shoreline technologies and some traditional hard infrastructure elements (Chen et al., 2022). The zone for this project is coastal, which encompasses the project site, focusing interventions on shoreline stabilization, erosion reduction and storm surge. The project site scale focuses on localized problems on a single property, such as managing rainwater or stabilizing a shoreline (Cote & Nightingale, 2012). Community scales typically span multiple properties. The design alternatives will offer different solutions that can be layered and applied in stages, starting with site-scale interventions and expanding to community-scale interventions.

Unlike traditional gray infrastructure technologies such as seawalls and bulkheads, which can exacerbate erosion and disrupt natural sediment movement, NbS works with ecological and hydrodynamic processes to mitigate wave energy and buffer storm surge (Aghaloo et al., 2024; O'Leary et al., 2023; B. Webb et al., 2019). Living shorelines, for example, incorporate a combination of vegetation, sediment and strategically placed structural elements such as marsh sills or oyster reefs to reduce erosion while supporting biodiversity (Wakefield, 2020). Breakwaters are designed to attenuate wave energy in high-energy areas, promote sediment accretion and provide habitat for marine life in addition to energy dissipating functions (Debele et al., 2023). The selection of an appropriate NbS depends on site-specific parameters, including tidal range, wave energy, soil composition and erosion history.

NbS can additionally be woven into programming to maximize co-benefits to enhance the overall site experience. Multi-use paths and greenways can be incorporated throughout a site to guide visitor along rivers and other natural features (Pimbert & Pretty, 2013). The trails connect places and additionally link habitats, increasing connectivity (Jacob et al., 2024). Additional green infrastructure elements such as vegetated swales and the incorporation of permeable trail surfaces increase stormwater capture and infiltration, improving water quality and adding an effective stormwater management measure (Benedict et al., 2006). Increasing indigenous vegetation increases the site's biodiversity and additionally adds a layer of aesthetic enhancement (Navarrete-Hernandez & Laffan, 2023). By integrating programming with sustainable materials and NbS solutions where possible, site resilience improves while providing visitors with benefits such as enhanced ecosystem services, improved circulation and support for mental well-being (Felappi et al., 2020).

Potential interventions for the designated project site also include non-structural options. Nature-based interventions can address issues such as habitat degradation, flooding, biodiversity loss, sediment and water quality issues (Chen et al., 2022). Including indigenous enhances resilience by mitigating coastal flooding and addressing sediment loss and shoreline erosion. Creating or enhancing marsh areas addresses multiple issues, such as absorbing low energy waves, mitigating coastal flooding, shoreline stability, increasing biodiversity and providing another layer of erosion control (Boogaard et al., 2023). To restore the coastline and reclaim land, beneficial use of dredged material is used for shoreline protection, restoring habitat and coastal ecosystems, and in beach nourishment scenarios (Boogaard et al., 2023). A combination of non-structural and structural interventions is a valuable shoreline stabilization method in places like Mayport, where high wave energy has gradually eroded the shoreline.

To enhance resilience and ensure long-term sustainability, NbS must be evaluated in the broader local context, incorporating community perspectives and priorities. Implementing the mentioned NbS requires active community participation to align with the community's long-term vision and goals (Benedict et al., 2006). While these solutions are resilient and cost-effective, their potential to protect key infrastructure is often misunderstood or undervalued (Dario et al., 2024). Overcoming this requires an ongoing process of engagement, which involves gathering public input, documenting how the identified sites are used and conducting surveys to better understand environmental conditions (Doğu et al., 2024b). Sharing design possibilities based on public input and maintaining open communication with residents ensures the NbS meets resilience goals and reflects the knowledge and preferences of the Mayport community.

Permitting

When conceptualizing different NbS to aid in promoting coastal resilience in a vulnerable location, the necessary permitting must be understood and obtained to begin shaping the coastal landscape and its infrastructure. Coastal areas are often subject to strict regulations to protect sensitive ecosystems, prevent erosion and manage flood risks. Permits ensure that the proposed design complies with federal, state and local environmental laws and regulations, such as the Clean Water Act, Coastal Zone Management Act and Endangered Species Act (Grosso, 2015).

Due to the heightened sensitivity of coastal ecosystems, permitting typically requires environmental impact assessments to evaluate how construction and pollutants might affect wetlands, wildlife habitats and water quality. This ensures that the project minimizes harm to the environment and promotes sustainable practices. Permitting is essential because it helps ensure the public's safety. When natural infrastructure projects such as living shorelines or dune restoration are undertaken, permitting ensures the projects are engineered to provide effective protection for communities and reduce risks to life and property (Grosso, 2015). Before engaging in community participation, it is important to understand the steps, codes, policies, and any additional guidelines that will inform the design and future implementation (Evans et al., 2017).

NEPA

The National Environmental Protection Agency (NEPA) requires the federal government to consider the environmental impacts of a project prior to implementation. The act, signed in 1970, requires federal agencies to evaluate the potential environmental effects of their proposed actions, including projects, permits, policies and programs. This evaluation is done through either an Environmental Assessment (EA) or a more detailed Environmental Impact Statement (EIS), depending on the potential impact's significance (United States Environmental Protection Agency, 2024). As part of NEPA, the public must be informed and involved in the decision-making process. Agencies must make the environmental assessments and impact statements available to the public, allowing for public comments and input. This ensures transparency, accountability and gives communities a voice in projects that might affect their environment.

Section 404 of the Clean Water Act

Another form of permitting that may impact the design and implementation process is Section 404 of the Clean Water Act. According to the act, the Secretary of the Army, acting through the Corps of Engineers, must authorize the release of any dredge or fill materials into any waters, including wetlands. The main goal of the permit is to protect water quality and aquatic ecosystems. For coastal infrastructure projects using NbS (like living shorelines, wetland restoration, or dune stabilization), obtaining a Section 404 Permit is essential if the project involves filling or altering wetlands or other waters (US Army Corps of Engineers, 2024). Designing NbS aligns well with the goals of the Section 404 Permit, as they aim to restore or enhance natural ecosystems rather than degrade them.

Florida Department of Environmental Protection (FDEP) Environmental Resource Permit (ERP)

To comply with state regulations, the project may require permitting through the Florida Department of Environmental Protection's (FDEP) Environmental Resource Permit (ERP). The ERP ensures that development activities protect water resources, manage stormwater effectively, prevent flooding, maintain water quality and conserve natural ecosystems. This comprehensive focus helps safeguard Florida's environment, particularly in sensitive coastal and wetland areas.

The ERP, like other environmental permits, focuses on protecting habitats and ecosystems, preserving natural landscapes, preventing increased flood risk and monitoring water quality to avoid pollution that could harm local communities and ecosystems (Florida Department of Environmental Protection, 2024).

National Oceanic and Atmospheric Administration (NOAA) Coastal Zone Management Act (CZMA)

Under the CZMA, coastal construction is monitored to ensure state and federal priorities are aligned on any project. A key part in managing coastal areas is ensuring the protection and sustainable use of coastal resources, including beaches, wetlands, estuaries and wildlife habitats. The CZMA aims to minimize environmental impacts from development, pollution and other human activities while enhancing public access to coastal areas (National Oceanic and Atmospheric Administration, 2024).

Participatory Frameworks

When pursuing community engagement in decision making and design planning processes, frameworks are used to create positive and effective community engagement. Governments are challenged to develop ways to make diverse voices heard through public engagement and decision making. Engaging the public in decision-making processes prompts stronger accountability, holding these institutions to their commitments (Burdett & Sinclair, 2024). Typologies are a useful way to help entities (e.g., the government) to differentiate between different types of participation, often placing approaches in a hierarchical range. Each typology carries a set of assumptions and characteristics (Cornwall, 2008).

For this project, five main frameworks are considered for community engagement with the Mayport community: Arnstein's Ladder of Citizen Participation, Jules Pretty's Typologies, Sarah White's Four Dynamics, IAP2 and Dutch Dialogues. The frameworks are intended as exploratory options to be developed further with the Mayport community once a preferred design alternative is selected through this project's process. Each framework proposes a similar structure and becomes successively more current for the purpose of side-by-side comparison and to ensure recent approaches are being considered. The frameworks are assessed by their differences, potential strengths and weaknesses and how the preferred framework could be used to guide and inform future co-design opportunities with Mayport's community.

Arnstein's Ladder

In 1969, Sherry Arnstein shared her foundational public participation framework "A Ladder of Public Participation" (Arnstein, 1969). Arnstein's framework has served as the base for many other participatory frameworks and has been used in a wide range of fields including forestry, social work, marine policy, criminology and urban planning (Slotterback & Lauria, 2019). Such a widely accessible and applicable framework continues to hold merit decades after its emergence and will, therefore, serve as the first public participation framework to be examined.

Arnstein developed the Ladder of Participation in response to controversy over citizen participation and citizen control. Believing a provocative typology would best capture the voices of the marginalized or "have nots" (Arnstein, 1969). The "have nots", as described by Arnstein are those excluded from political and economic processes (Kotus & Sowada, 2017). Arnstein's framework advocated the inclusion of such voices, proposing governments partner with local communities to make this possible (Slotterback & Lauria, 2019). Arnstein writes, "The idea of citizen participation is a little like eating spinach: no one is against it in principle because it is good for you." (Arnstein, 1969). The creation of her participatory framework not only includes the "have nots" in decision making processes, but also provides a structured tier of engagement, delineating the eight rungs, or levels, of participation (Macgregor, 2008).

Arnstein's ladder consists of eight rungs divided into three categories for further differentiation. The first category, Nonparticipation, includes the lowest two rungs of the ladder, Manipulation and Therapy. This category consists of a substitute for genuine participation. These rungs exist at the bottom of the ladder because they are the least likely to capture community voices. Rather, programs at this level enable those in charge to "educate" or "cure" participants (Arnstein, 1969).

The second category includes Informing, Consultation and Placation, these middle rungs make up the "Degrees of Tokenism" category. In this second category, the public hears and is heard, however, there is nothing to ensure those in power will act on public feedback. At these levels, there is nothing in place to ensure follow-through. The fifth rung, Placation, remains in this *tokenism* category and above the previous two, because at this level, the public can assist with advising but the power and authority remains with those in institutional power (Arnstein, 1969).

The third and remaining category, Citizen Power, consists of the remaining three and highest rungs, Partnership, Delegated Power and Citizen Control. At these higher levels, the participants have increasing leverage and power in decision-making. The Partnership rung entails negotiations and tradeoffs with those in institutional power. In the upper two rungs, Delegated Power and Citizen Control, participants either have the power to make most decisions or have full managerial power (Arnstein, 1969).

Jules Pretty's Typologies

In "The Many Interpretations of Participation", Jules Pretty, Professor of Environment and Society at the University of Essex, created a typology of participation that illustrates how participation can advance from tokenism to independent action (J. Pretty, 1995). The focus of Pretty's proposed typology focuses on the motivations and degrees of stakeholder involvement

(Pimbert & Pretty, 2013). Pretty's typology categorizes public participation into four goals and seven types. The seven stages range from superficial, externally controlled forms to more autonomous, empowering forms of engagement (Bass et al., 1995).

Four Goals for Public Participation

In "Participation in Strategies for Sustainable Development" (Bass et al., 1995), Jules Pretty and other contributing authors outlined four goals for public participation. According to the publication, true sustainable development must meet four goals. The first goal is *meeting the needs of tomorrow's generations through today's decisions*. The goal takes the actions of many groups to make changes that will affect subsequent generations (Bass et al., 1995). Key information such as policy, market incentives, approaches for continuous improvement, social preferences, norms, economic and environmental conditions are necessary to develop scenarios that best account for future uncertainties and provide the best chance at a sustainable future.

The second goal, *balancing social, economic and environmental objectives*, explains that in addition to people-centered approaches, there is a need for the application of other informative aspects that enhance sustainable development outcomes (Bass et al., 1995). The third goal, *managing natural systems within their limits*, means recognizing their value, balancing different needs and creating policies and incentives for sustainable use (Redclift, 1992). The last goal, *focusing on development, not growth*, aims at maintaining long-term quality of development. Rather than focusing on one narrow aspect of growth, this goal promotes development among adjacent facets to support broader, sustainable growth (Uphoff, 1992).

With the four goals for sustainable development established, Pretty details seven types of participation. A motivating factor behind this framework is ensuring participants have some stake in the participatory matters at hand, rather than dragging them into matters that are of little interest to them (Sachs, 1992). Similarly to Arnstein, the participation types are ranked according to level of engagement and empowerment, from least empowered to most empowered. *7*

Levels of Engagement

In the first level, *Manipulative Participation*, the participation is symbolic. The representatives or stakeholders hold no real power or influence. The second level, *Passive Participation*, advances to people being informed of decision already made with no opportunity for feedback. The third, *Participation by Consultation*, involves asking stakeholders for information and opinion, but the decision making is controlled by those in power, often external agents (J. N. Pretty, 1995).

Participation for Material Incentives involves a transactional approach where stakeholders contribute resources or labor in exchange for tangible rewards, such as food or cash. While this can fulfill short-term objectives, it does not encourage long-term commitment or independence (Conrad & Hilchey, 2011). *Functional Participation* focuses on involving stakeholders in achieving externally defined goals, with some shared decision-making, though key decisions are often made beforehand. *Interactive Participation* marks a significant shift toward collaboration, as stakeholders engage in joint analysis, decision-making and the strengthening of local institutions. This promotes a sense of ownership and supports sustainable outcomes. At the highest level, *Self-Mobilization*, communities independently initiate and manage projects. External support may be sought, but control and decision-making remain within the community (J. Pretty, 1995).

Sarah White's Typology

In 1996, Sarah White's article, 'Depoliticizing Development: The Uses and Abuses of Participation', presented White's typology of participation. White views participation as a highly politicized process, expressing that 'participation' is a catch all term that may not signify true power (S. White, 1996). When assessing the politics of participation, two main questions are *who?* and *which level*? By asking 'who?', it is understood that participants are not homogenous (White & Choudhury, 2007). Going a step further than Arnstein, White notes that, "special mechanisms are needed to bring in relatively disadvantaged groups." (S. White, 1996). The second question of 'which level?' of participation signifies more is needed than simply involving stakeholders. True participation means locals are active in management and decision making (S. C. White, 1996). Creating quotas to fulfill more diverse participation does not ensure the disadvantaged or 'hard to reach' have a say. Attempting inclusion in this manner only facilitates more dynamic and informed participation. This is White's call for development beyond the term 'participation' as true inclusion depends on much more (Tisdall, 2013).

Four Types of Participation

White addresses the need for further development by distinguishing four types of participation and the characteristics of each (S. White, 1996). Whereas Arnstein's and Pretty's typologies act as progressional ladders, White's four categories are tools to identify conflicting ideas about participation by highlighting how people are making use of engagement (Cornwall, 2008).

The first of White's categories is *Nominal* participation. This type of participation serves as a display to legitimize actions or programs by the implementing agency. For those on the receiving end, this type represents inclusion and the potential to access and retain benefits. Its function is to enhance visibility without substantive engagement (Shirk et al., 2012). The second type, *Instrumental* participation, serves the role of efficiency for the implementing agency. Participation at this level means limiting funders' input by relying more heavily on community contributions to make the process more cost-effective. To stakeholders, this level signifies the increased use of their time. Project related labor and other associated activities are higher at this stage. Instrumental participation intends to increase the cost effectiveness of the project (White & Choudhury, 2007).

The third type of participation, *Representative* participation, ensures that participants have a voice in shaping projects and decisions (White & Choudhury, 2007). This form promotes sustainability by incorporating local input, creating a more sustainable model by avoiding potential dependency (S. White, 1996). Participants see it as a way to influence outcomes and assert their interests. This level serves as a means to give people voice in shaping their futures and development. The final type of participation (Shirk et al., 2012), Transformative, aims to empower participants through collective action and decision-making. This process fosters awareness, confidence and systemic change as stakeholders gain heightened empowerment (Cornwall, 2008). It can simultaneously serve as both a means and an end, promoting empowerment at multiple levels and creating a sustainable process (S. White, 1996).

IAP2

The International Association for Public Participation (IAP2) was established in 1990 in response to the growing need for a professional framework around public participation and remains up to date. IAP2 was founded in the United States, but its mission and influence quickly grew to become international (IAP2, 2024). At its core, IAP2 was created to provide a standard for public participation practices that emphasized inclusivity, transparency and the ethical involvement of communities in decision-making processes (Ross et al., 2016). The organization initially focused on sectors such as urban planning, environmental impact assessments and infrastructure projects, where engaging communities and stakeholders was recognized as essential for sustainable and accepted outcomes (Foroughi et al., 2023; Quick & Bryson, 2022). The framework consists of three pillars consisting of a Spectrum of Public Participation, Core Values and a Code of Ethics (IAP2, 2024).

The Spectrum of Public Participation

IAP2's spectrum consists of 5 stages: *inform, consult, involve, collaborate* and *empower (IAP2, 2024)*. Each stage is paired with concise information that details the public participation goal, what it promises to the public and an example of the tools that would best pair with that stage of engagement.

In the 'inform' stage, the goal is to provide the public with information necessary to understand the decisions being made (Krishnaswamy, 2014). The associated promise is to keep the public informed, ensuring transparency and clarity (Bobbio, 2018)}. A limitation of this stage is that it does not offer room for feedback, which could limit initial public buy-in (Burdett & Sinclair, 2024). To aid in informing, fact sheets, websites, open houses, or other education, informative resources are utilized (IAP2, 2024).

'Consult', the second stage, aims to obtain public feedback on proposals or decisions. The promise to the public at this level is to listen to and acknowledge their feedback, demonstrating a willingness to hear public opinions (Ross et al., 2016). A potential weakness to be mindful of, however, is that feedback may not result in significantly swaying decisions, which could lead to the public's frustration. To assist this stage in operating smoothly, tools such as focus groups, surveys, or public meetings are encouraged (IAP2, 2024).

The 'involve' stage works with the public to ensure their concerns are understood and truly considered. This promises that the publics' concerns will directly influence the decisions being made (Barry & Legacy, 2023). A strength of this stage is that it builds relationships and leads to more informed and integrated decision making (Brown & Chin, 2013). A potential weakness is that this stage requires more resources and may create stakeholder expectations that are difficult to meet or manage. To strengthen the process, workshops or polling can be planned to capture concerns (IAP2, 2024).

The 'collaborate' stage goal is to partner with the public in every aspect of the decision-making process (Stephens & Berner, 2011). The promise to the public associated with this stage is making decisions will be a shared responsibility, which encourages co-creation and shared ownership (Ross et al., 2016). A potential limitation is this stage can be time-intensive and require high levels of trust or transparency, which may or may not be fitting or possible at the given time (Ross et al., 2016). Citizen advisory committees and participatory decision-making methods can be implemented at this level to create a better partnership with the public (IAP2, 2024).

The fifth and last stage, 'empower', delegates the final decision-making to the stakeholders. The promise is the implementation of the final decisions made by the public and the strength lies in its ability to offer maximum inclusivity (Triplett, 2015). A limitation of this stage is the risk of disagreement or ineffective outcomes if a consensus cannot be reached among stakeholders. To aid in this process, citizen juries, ballots, or delegated decisions can be implemented to enhance the final decision-making process (IAP2, 2024).

Core Values

IAP2's core values are guiding principles designed to ensure ethical and effective engagement across diverse cultural, religious and national contexts (IAP2, 2024). The purpose of defining such values is to make sure the decisions made best reflect the interests and concerns of stakeholders and those potentially affected (Bobbio, 2018). The IAP2 Core Values emphasize that public participation should involve those affected in the decision-making process and ensure that stakeholder feedback influences final outcomes (Triplett, 2015). It should promote sustainable, long-term decisions by addressing the needs of all participants and actively seek out and facilitate the involvement of those potentially impacted (Burdett, 2024). Additionally, participation methods should be intentionally designed with stakeholder input, providing the public with the necessary information to engage meaningfully (Stephens & Berner, 2011). Finally, the process should clearly communicate how stakeholder contributions influenced the decision (IAP2, 2024).

Code of Ethics

The IAP2's code of ethics provides guidelines for ethical behavior of public participation practitioners. An ethics code is necessary to ensure integrity, transparency and fairness in the process (IAP2, 2024). It emphasizes building trust, accurately defining the public's role, ensuring open access to information and providing equal opportunities for stakeholders to influence decisions (Ross et al., 2016). Practitioners are committed to respecting communities, avoiding divisive strategies and advocating for the process rather than specific outcomes (Quick &

Bryson, 2022). They also pledge to fulfill commitments in good faith, mentor new practitioners and educate others about the value of public participation (Dawodu et al., 2021). The Spectrum, Core Values and Code of Ethics work together to form a comprehensive framework that supports ethical, transparent and effective public participation. They provide an accessible for practitioners to engage stakeholders meaningfully, ensuring decisions are informed, inclusive and well-supported (IAP2, 2024).

Dutch Water Management

The last potential framework for engaging the community of Mayport in data-driven, community engaged design lies in Waggonner & Ball's resilience planning model, Dutch Dialogues. In the Netherlands, water management is overseen by the Minister of Infrastructure and Water Management, guided by three primary goals: preventing and mitigating flooding and water scarcity, protecting and enhancing the chemical and ecological quality of water systems and ensuring water systems meet their designated social functions. The model, named after its Dutch inspiration and partnership, seeks to combine water management strategies of the Netherlands with community input through locally curated projects aimed at flood management and reduction.

The Netherlands has earned a global reputation for its expertise in water management, which is essential in a country where much of the land lies below sea level. Without its network of dikes, dunes, locks, pumps and flood barriers, roughly 65% of the nation would face significant flood risks (Pilarczyk, 2007). This necessity has driven the Dutch to develop highly advanced systems for managing water and protecting their population (Reinhard & Folmer, 2011). At its lowest point, the Netherlands is 6.7 meters below sea level, making the need for innovative water solutions a constant priority (Pilarczyk, 2007).

For centuries, water has shaped Dutch urban planning and society. Over the past 800 years, the Netherlands has lost approximately 570,000 hectares (1.5 million acres) of land to the sea (Burdett, 2024; van der Brugge et al., 2005). However, advances in dike construction, drainage and pumping technologies allowed the Dutch to reclaim nearly 520,000 hectares (1.3 million acres), including drained lakes and enclosed coastal areas (van der Brugge et al., 2005).

Room for the River

Flood risk management in the Netherlands has shifted since the 1970s from a prominently engineering-based approach to a broader, more integrative strategy that includes water management, spatial planning and ecology. As a result, the Netherlands has become a leader in utilizing NbS for addressing water challenges. These approaches use natural systems alongside traditional engineering to reduce flooding, improve water quality and increase resilience to climate impacts (FEMA, 2021).

The *Room for the River* program, introduced in 1995 and approved in 2007, marked a significant shift in Dutch water management by prioritizing natural river dynamics over traditional control methods. Prompted by near-flood disasters in the 1990s, the program aimed to enhance flood safety and improve spatial quality by creating more space for rivers (Van der Velde et al., 2006). Strategies included setting dikes farther back, restoring floodplains and creating natural riverbanks with gradual slopes to better manage floodwaters (van der Brugge et al., 2005). This approach, which embraces living with water rather than controlling it, became a cornerstone of the Dutch Dialogues methodology (Environment, 2023).

The Room for the River program introduced a multi-level governance model where national, regional and local agencies collaborated across disciplines like water safety, planning, agriculture and nature (Rijke et al., 2012). The national government set decision frameworks for water safety and spatial quality, while local and regional stakeholders developed plans and made decisions for 39 regional projects. A central program office coordinated progress, evaluated design quality, provided expertise and facilitated regional efforts, allowing local governments to align water safety goals with community priorities

The Dutch approach to water management, marked by innovation and intentionality, serves as the foundation for the Dutch Dialogues (Waggonner & Ball, 2019a). This resilience planning tool emphasizes the importance of reclaiming land, living with water, prioritizing safety and integrating green and blue infrastructure. The Dutch Dialogues also draw from Room for the River's multi-level, multi-disciplinary model, avoiding a purely top-down approach (Dale Morris, 2019). These core principles and planning strategies inspired the creation of the Dutch Dialogues and continue to guide and shape its implementation today.

Dutch Dialogues

Transitioning from foundational frameworks to practical application, the Dutch Dialogues model was evaluated as a tool for resilient planning and public participation. This framework is the most relevant to the nature and objectives of this project and, therefore, receives the most in-depth consideration. Established in 2006, this approach was designed to address resiliency challenges in communities facing water specific challenges by developing illustrative, rather than prescriptive planning ideas (Waggonner et al., 2014a). Dutch Dialogues aims to answer the question: *how do we deal with water in various conditions (Waggonner et al., 2014a)*?

David Waggonner, a New Orleans-based architect and urban planner, in collaboration with Dutch water management experts, envisioned merging Dutch expertise in integrated water management with local planning efforts to create sustainable, resilient solutions for New Orleans after the destruction of Hurricane Katrina (Dale Morris, 2019). The Dutch reached out to professionals in New Orleans to explore ways they could offer assistance, while Waggonner was simultaneously seeking their support. The Dutch Dialogues grew out of these requests. Key contributors included the Kingdom of the Netherlands, represented by engineers, planners and urban designers with centuries of experience in flood resilience and Henk Ovink, a Dutch water expert who became a global advocate for water resilience strategies (Waggonner & Ball, 2019a). The first Dutch Dialogues workshops were held in 2008, focusing on integrating water management into urban design for New Orleans (Wesselink, 2007). The approach has since become a globally recognized framework for addressing water-related challenges and promoting urban resilience (Waggonner et al., 2014b).

Set apart from other frameworks and models, Dutch Dialogues focuses specifically on water. For cities impacted by water challenges such as sea-level rise, Dutch Dialogues focuses on surge, tidal, rainfall, stormwater drainage, surface, groundwater or a combination (Government, 2020). The sustainability mindset reframes projects to consider long-term outcomes. Dutch Dialogues takes a unique approach compared to traditional design methods by intentionally combining multiple disciplines in a single, integrated process (Meyer & Nijhuis, 2013). It brings together knowledge from different fields, involves participants from various nations and age groups and centers its efforts on the idea of living with water while prioritizing risk reduction

(Dale Morris, 2019). It is for this reason that Dutch Dialogue project teams consist of designers, landscape architects, architects, engineers, planners, geographers, stakeholders and other specialists (Wesselink, 2007).

Since their first workshops in 2008 New Orleans, Dutch Dialogues has been used as an integrative planning tool in cities such as Charleston, South Carolina, Norfolk, Virginia, and Miami, Florida (Wesselink, 2007). The model has proven to be successful as other cities look to utilize similar, water focused methods in the future. Due to its relative newness, trademarked status and steady expansion, there is not extensive literature regarding Dutch Dialogues. The available literature currently exists on the founding partners' websites, the project cities' websites and the final reports published upon the completion of the Dutch Dialogue projects. As this process evolves and is adopted by other water cities, it is assumed the literature surrounding this method will grow. This assessment is based on the available literature mentioned.

The Dutch Dialogue planning and participation method begins with a preliminary assessment of the city's water-related challenges, such as flooding, sea level rise, or stormwater management (Meyer & Nijhuis, 2013). Key stakeholders, including local government officials, community groups, academic institutions and private sector representatives, are identified and engaged through initial meetings and discussions (American Planning Association, 2009). A central component of this model is that the project is organized from within the community or involves significant participation from local residents, especially when government agencies are involved (Dale Morris, 2019). Experts begin by studying the city's historical, geographical and hydrological context, gathering data and mapping current vulnerabilities alongside potential future challenges (Environment, 2023). This foundational understanding of the city's issues forms the basis of the project, strengthening relationships with stakeholders and ensuring a community-driven, data-informed design approach.

The next phase involves designing the workshop process and assembling interdisciplinary workgroups that focus on specific areas, such as regional planning, district-level interventions and neighborhood-scale solutions (Wesselink, 2007). These distinct scales of inquiry allow for targeted, adaptable designs that address the unique needs at each level (Zevenbergen et al., 2013). Collaborative, multi-day scenario development sessions bring together Dutch and American professionals, community leaders and residents (Architects, 2013; Environment, 2023; Government, 2020). Activities include site tours to observe conditions like subsidence, drainage inefficiencies and urban vulnerabilities firsthand. Charrette-style workshops encourage the development of place-based solutions, providing an opportunity to present preliminary ideas and gather valuable feedback (Waggonner et al., 2014b).

This inclusive, hands-on approach ensures that the designs reflect a wide range of perspectives and address both technical and community priorities (Waggonner & Ball, 2019a). The goal of Dutch Dialogues is to create a presentation that allows participants to form their own judgments by the end of the workshops (Dale Morris, 2019). In addition to flood prevention, the workshops address all aspects of the planning process, using physical elements to influence and enhance other co-benefits (Government, 2020). The model emerged out of the need to reconnect our society with water, making the shift toward more sustainable practices while also quantifying benefits and changes (Zevenbergen et al., 2013).

Site Considerations

The project must be tailored to the specific context of each place. While the original Dutch Dialogues project cannot be replicated exactly, it serves as a model that can be adapted to meet the needs of different cities (Dale Morris, 2019). It incorporates expertise from a variety of outside sources, creating better informed solutions. The first step is to understand the problem, which is unique and site specific (Environment, 2023). There is a strong emphasis on understanding local conditions and challenges. What works in one place may not be applicable elsewhere, but the underlying process and intent can be applied to other contexts if the same ambition remains (Waggonner et al., 2014a).

For a larger paradigm shift, Dutch Dialogues aims to align different sectors of society to institutionalize these experimental methods and techniques, making them standard practice (Dale Morris, 2019). Each project will have a unique structure and varying levels of community involvement (Dale Morris, 2019). Government models can often complicate the planning process, making it more difficult to engage in an iterative approach (Dale Morris, 2019). However, water doesn't recognize political boundaries, so successful projects emphasize regional collaboration and solutions at multiple scales (Waggonner et al., 2014a).

When evaluating a site for Dutch Dialogues, several questions guide the decision-making process: *Can we make a difference in this region? What challenges do they face? Can this team effect real change together? Is the area ready to embrace the paradigm shift? Can these ideas go beyond an academic exercise and be implemented in practice? Are there funding opportunities and how can we ensure that the proposed designs will work? (Dale Morris, 2019)*. Participants in these workshops invest considerable time and effort, often traveling and committing several days to the process. Given that Dutch Dialogues is a tremendous civic undertaking, these factors are crucial in determining how the model operates and where it can have the greatest impact (Architects, 2013).

Evolving Community Engagement

Upon reviewing the frameworks, it is important to recognize that community engagement and co-design do not always follow a predefined structure. These processes can unfold at various stages of a project. Village Homes, an energy-conscious and community-oriented residential development project that began in 1973, is an example of how community engagement can shape a design project across multiple phases (Corbett & Corbett, 2000). This case study is valuable because it emphasizes that community engagement is not always a step-by-step model but that co-design often adapts and is nonlinear. It highlights community engagement before and after the chosen central design, showing that continued co-design is possible even after selecting a preferred design alternative. Village Homes showed how early design concepts could evolve through exploring different options, community feedback, and negotiation with regulatory bodies. The project additionally illustrates that community involvement does not end after initial plan generation; residents were actively engaged through the implementation phase.

Mike and Judy Corbett, the architect and lead developer of Village Homes, credited much of their inspiration to the greenbelt towns of Britain and the United States (Corbett & Corbett, 2000). The Corbetts' architecture, planning, ecology, and environmental psychology backgrounds shaped their approach to the project and the values they wished to exhibit in the proposed community. Initially, their vision was to create a neighborhood that would reduce the energy needed for everyday life and create a strong sense of community among residents (Thayer, 1989).

When the Corbetts first brought their idea to the City of Davis, they were met with resistance (Francis, 2002). Their proposal challenged standard zoning practices such as narrower roads, cul-de-sacs, and mixing agricultural and residential land uses (Condon, 2000). Despite pushback from city officials, there was interest and momentum among local families in reimagining neighborhood life. Judy Corbett began meeting with a group of over 30 families, holding regular gatherings to envision what the proposed community could look like (Francis, 2002). This early engagement helped shape the initial concepts, focusing on "living more lightly on the land." After a year of meetings, however, the community meetings ended as many families realized a project of this scale was financially out of reach (Dingemans, 2018).

Despite initial project setbacks, the Corbetts continued the project. Mike and Judy refined the designs based on ideas from those early community meetings and then presented the plan to the city. The design concepts faced pushback, including continued concerns about dead-end streets, unconventional drainage, and the mix of land uses (Thayer Jr, 1977). The Corbetts continued conversations with city officials, adjusting and comparing alternatives until a final, preferred alternative was selected and approved (Dingemans, 2018). After approaching more than 30 banks, they finally secured financing for the project (Francis, 2003).

While the Corbetts generated the final site plan, it was informed by the year-long engagement effort with community members. Once construction began, public participation continued. Residents had input on the design of shared open spaces, and the community regularly organized "work parties" to design and build these areas together (Thayer, 1989). The homeowners' association set aside funds for large projects like the community center, pool, and more minor, resident-directed improvements, including $600 for every eight residents to use for shared space enhancements. In this way, co-design remained an ongoing process, extending beyond the initial concept generation phase (Francis, 2003).

Village Homes demonstrates that public engagement does not have to follow a fixed format. Co-design can take many forms and evolve. Like the Mayport project, the Corbetts used early community conversations to inform the creation of a preferred alternative, which served as the basis for further discussion and refinements. In both cases, the preferred alternative does not represent finality in design. Instead, the design is shaped through input, adapted in response to constraints, and remained open for community participation, even after construction began. The case study of Village Homes challenges the idea that public input must happen only at the start; it shows that co-design can be revisited and reimagined at every stage.

NEPA Analysis

The National Environmental Policy Act (NEPA), an essential regulatory framework in the United States, requires federal projects to evaluate and address potential environmental impacts (Clark & Canter, 2024). A key component of the NEPA process is *Alternatives Analysis*. Various designs that meet the project's goals are examined during this stage to minimize potential future environmental harm in implementation (United States Environmental Protection Agency, 2024).

The first step is defining the purpose and need for the project. During the subsequent scoping phase, stakeholders and potential environmental impacts are identified (Eccleston, 1999). These guides which alternatives are considered in initial concept generation. Central to this phase is the no-action alternative, which assesses the potential outcome of not moving forward with the project by keeping everything ‘as is’. This serves as a baseline to which other alternatives can be compared to gauge design effectiveness and relative impacts (Canter & Clark, 1997). Potential design alternatives include design elements, construction methods, or mitigation measures to reduce adverse environmental effects (Keys, 2017). If it is likely that the project will have an environmental impact, an Environmental Impact Statement (EIS) will be prepared. The EIS provides an analysis of the potential consequences of each alternative. Public input is often included in this phase (Glucker et al., 2013). After considering all the impacts, the agency issues a Record of Decision (ROD), explaining which alternative was chosen and why. The ROD addresses how the environmental impacts will be mitigated (United States Environmental Protection Agency, 2024).

Several case studies across the United States highlight how NEPA's Alternatives Analysis has shaped similar projects. One example is the Alaska Natural Gas Pipeline project, proposed between 2004 and 2015 (U.S. Department of Energy, 2023). The U.S. Army Corps of Engineers led the NEPA process for the pipeline, analyzing several routes through Alaska's environmentally sensitive areas, including tundra and wetlands (Myers, 1974). The chosen route avoided critical wildlife areas and included mitigation measures to protect the vulnerable areas and existing ecological systems (Cicchetti, 1993). Another example is the Dakota Access Pipeline, which underwent an extensive NEPA review in 2016. The U.S. Army Corps of Engineers evaluated the pipeline's potential impacts, focusing on concerns over oil spills and the project's effects on Indigenous communities (Johnson, 2019). After public opposition and legal challenges, the route was altered to avoid culturally significant areas (Fredericks, 2020).

In the San Francisco Bay Area, transportation projects such as modifications to freeways and the addition of high-speed rail lines included NEPA's Alternatives Analysis (U.S. Department of Transportation, 2024). Various routes and construction methods for bridges, tunnels, and transit systems were considered to minimize air pollution, noise, and impacts on wetlands and wildlife habitats (Metropolitan Transportation Commission, 2024). Lastly, the Los Angeles International Airport (LAX) expansion, which spanned from 2010 to 2020, included an Alternatives Analysis conducted by the Federal Aviation Administration (FAA) (Wyatt, 2011). The project focused on managing air traffic increases, reducing noise pollution, and minimizing community displacement. Mitigation strategies, such as noise-reduction measures and soundproofing buildings, were incorporated into the final plan (U.S. Department of Transportation, 2024).

By evaluating different design alternatives, the case study projects were designed to mitigate harm and ensure that a comprehensive understanding of environmental impacts informed the final decisions. Similar to these case studies, the Mayport alternatives will undergo a similar process to select a preferred alternative that best addresses project goals and environmental concerns.

Informing Alternatives

Methods such as inventory, analysis and synthesizing community feedback with information gained through the literature review will inform design alternatives. The next chapter will discuss the process of preparing for alternative generation. The final alternatives require data and community feedback to inform solutions and respond to site conditions and community preferences as strongly as possible. Topics such existing conditions. site inventory, and inventory mapping will detail the process of collecting and synthesizing data used to create basemaps for the design process. Subsequent topics such as community feedback and rating system will reveal how community input was collected and integrated into alternatives to be analyzed according to the author's relative rating system.

CHAPTER 3

METHODOLOGY

The methods to prepare for design alternative generation included acquiring the best available scientific data and community feedback for a deeper understanding of existing conditions and community preferences. Existing conditions and site data such as elevation, storm surge, rainfall patterns, plant communities, soil series types, and physiographic features were mapped and analyzed to inform project opportunities and limitations. Community input was acquired through a two-part community assessment provided by Carl Vinson Institute of Government to capture local opinions and preferences concerning visitation frequency, recreational and social engagement, overall satisfaction and coastal erosion.

Existing Conditions

Mayport Village and the Naval Station, positioned at the mouth of the St. Johns River and Atlantic Ocean, is nearly surrounded by water, with State Highway A1A as its only access point. The road leads to a car-ferry crossing at the heart of the community and serves as an essential connection for both the daily life of the community and an important local economy driver. However, A1A is increasingly at risk due to tidal and river flooding, particularly near the entrance to Mayport Village. The shoreline at Helen Cooper Floyd (HCF) Park and “Little Jetties” is eroding rapidly, leaving the road more exposed with each passing year. Although managed by the City of Jacksonville, HCF Park sits on land owned by the U.S. Navy and is intrinsically linked to Mayport access and way of life (UGA-DCRP, 2024).

The environmental and use factors present are impacting the site conditions and increasing the rate of erosion to the shoreline area adjacent to A1A. Up until the 1980s, the roadway was protected by about 100 feet of vegetated salt marsh and transitional upland habitats. Today, these ecosystems have mostly disappeared due to erosion, leaving the road vulnerable to the effects of waves and currents during high tide flooding events (UGA-DCRP, 2024). To restore as much shoreline as possible, protecting Naval and community assets, including infrastructure, ecosystem services, and public recreation, systems-level solutions will be necessary.

The lack of adjacent vegetated salt marsh impacts the safety and readiness of the base. The portion of A1A that leads into Mayport, as well as the gate that accommodates routine service and commercial traffic, has become exposed and more vulnerable without the shoreline to protect it. Issues with erosion are driven by wave and current energy interacting with the shoreline, which is exposed to the flow of the St. Johns River and associated ship wakes. Furthering the issue, there is a lack of planned circulation for this area. The Little Jetties sustains frequent weekly visitors, often people who have been returning to the site for years (20+). By gathering site data for an informed inventory process, we were able to match areas that would best support visitor use and ecological enhancement in the future.

Site Inventory

Initial Observations

During the early stages of the project's investigative phase, or 'Inventory', a site visitation was held in late October of 2024 for a two-day data collection trip. The collection and observation days were in the beginning of the typical work week, partly cloudy and the temperatures were in the high seventies. During the first day, I visited the site with other members of the project team. Using mobile real-time kinematic units, I explored the "Little Jetties" beach and the full length of the Helen Cooper Floyd Park (HCF), which is positioned between the St. Johns River and Chicopit Bay (Figure 1). During that time, I came across several beach and park visitors engaged in activities such as fishing, walking and camping (car and tent).

Figure 1: Project Areas of Interest, Mayport, Florida

There were equal parts foot and vehicular traffic. Portions of the site require visitors to park their vehicles and carry their supplies and belongings into the park.

RTK Collection

Using Trimble RTK units (Trimble Catalyst DA2), Trimble TerraFlex data collection application (TerraFlex, 2025), and an iPad, site elevation data was efficiently collected and stored, enabling precise coverage of a large area (Figure 2). The data collection process focused on identifying key landscape elements that could inform future design decisions, including terrain changes, built structures, vegetation boundaries, path and road centerlines and significant historic or character-defining features. Site-specific conditions such as steep banks, waterlogged areas, viewsheds, debris piles, discarded signage and observed water levels were documented to provide important context for later project phases. The recorded elevation data included x, y and z coordinates and was mapped and organized for further analysis and export using Trimble’s mapping applications.

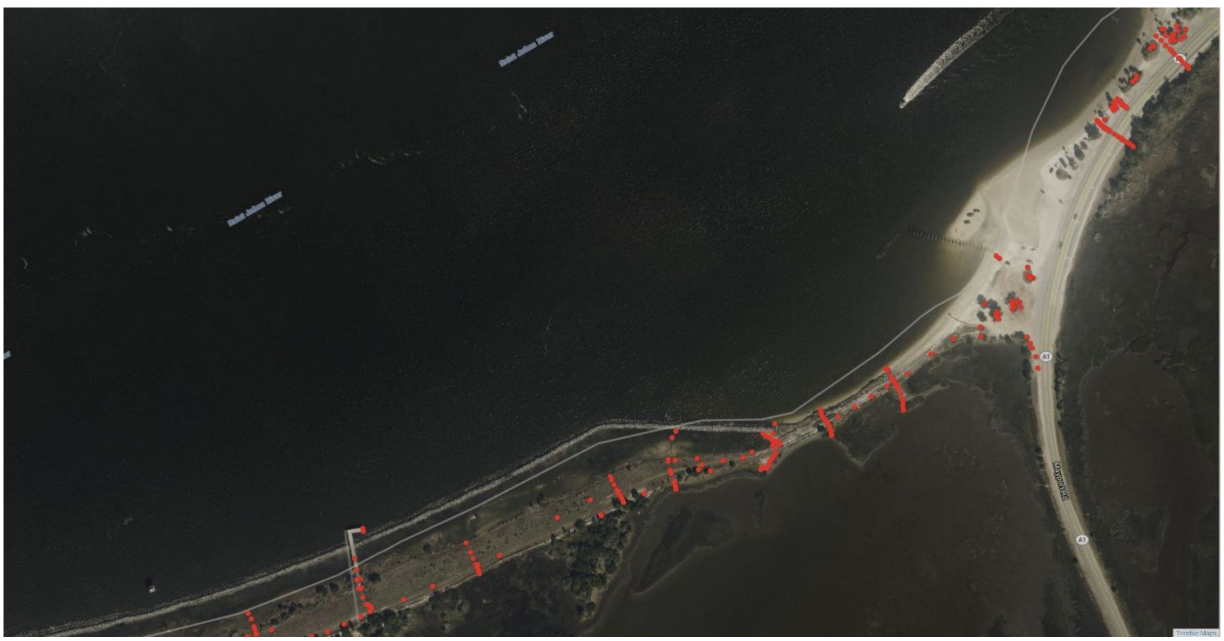

Figure 2: “Little Jetties” Elevation Data Collection Map (TerraFlex, 2024)

Inventory Mapping

The inventory mapping process is necessary for understanding the site's existing conditions and any factors that may influence future design and programming decisions. Collecting and analyzing data to create maps helps ensure the proposed design solutions are responding to the site's unique and existing conditions (Esri, 2025; TerraFlex, 2025). This process additionally allows for comparison between mapped data and what is present on-site through on-the-ground observations. This helps identify any inconsistencies, provides a clearer understanding of how the landscape might function and can signal recent landscape or usage changes that the designer should be aware of. Going through this iterative approach ensures the proposed interventions are not incorrectly informed and will best enhance the site's ecological, social and functional needs.

Maps

ESRI software (Esri, 2025) was utilized with GIS data layers and information from weather, climate, soil and municipal sources to map key site characteristics (App. A). Elevation, storm surge, rainfall patterns, plant communities, soil series and physiographic features were analyzed to better understand the site's conditions.

Physiographic Regions

According to physiographic region data, the project site is located within the Atlantic Coastal Plain, specifically in the Sea Island district. Within this district, the site contains three subdivisions that further define the landscape across different areas. The Atlantic Coastal Plain is generally characterized by low elevation, flat terrain and sandy soils. These landscapes often feature dunes, beaches and marshes, which provide habitat for coastal scrub, maritime forests and salt marsh ecosystems. The Sea Island district, a subregion of the Atlantic Coastal Plain, extends from northeast Florida into South Carolina and includes elevated sandy ridges and stabilized dunes. These areas support maritime forests and estuaries, offering valuable insights into historical changes in sea levels.

The three subdivisions within this classification provide even more detail on the terrain, vegetation and soils found throughout the project site (App. A, Figure 4). The majority of the project area falls within the St. Augustine-Edgewater Ridge subdivision. This landscape is shaped by historic dune systems and features elevated terrain that transitions into marshlands and estuaries, acting as a natural buffer against coastal erosion and storm surges.

As the site extends into Helen Cooper Floyd Park, the terrain shifts from the St. Augustine-Edgewater Ridge subdivision into the Mandarin Plain. This area is characterized by flat topography, fertile soils, wetlands and pine flatwoods. Historically, its high capacity for water filtration has made it well-suited for agriculture. The farthest section of Helen Cooper Floyd Park, located away from A1A, falls under the Fort Caroline Ridge subdivision. This area is distinguished by an elevated ridge along the St. Johns River, featuring rolling hills, well-draining sandy soils and a mix of pine and oak forests.

Elevation

Elevation mapping of the site indicates some variation, though most of the area remains relatively level (USGS, 2024). Concerning the terrestrial portion of the site, A1A runs through the site at approximately 6.5 feet above sea level. The “Little Jetties” beach area slopes from A1A to sea level, with most terrain ranging between 3.5 and 5 feet in elevation with minimal change in elevation (App. A, Figure 5). The steepest slopes occur along the shoulders of A1A, where the land drops toward the St. Johns River.

Bathymetric data provided by project partners reveals a gentle underwater slope along the beach areas. In Chicopit Bay, tidal fluctuations highlight the gradual nature of the shoreline, with tidal elevations reaching 2.44 feet Mean Higher High Water (MHHW) and 2.22 feet Mean High Water (MHW) above sea level. In comparison, low tides drop to -2.32 feet (MLW) Mean Low

Water and -2.47 feet (MLLW) Mean Lower Low Water. However, near the Coast Guard Station, the primary area of concern, the shoreline experiences a rapid and significant drop in elevation as it approaches the shipping channel.

Storm Surge

The National Oceanic and Atmospheric Administration's (NOAA) National Storm Surge Risk data was used to map surge boundaries for storms ranging from Category 1 to Category 5 relative to the area's MHHW datum. (NOAA, 2021). The data shows that under Category 1 surge conditions, most of the site would be more than 6 feet below water levels, though areas with higher elevation in Helen Cooper Floyd would experience over 3 feet of water. In a Category 2 surge, water levels would exceed 12 feet in most areas, with higher elevation areas of HCF seeing levels above 6 feet. A Category 3 surge would raise water levels over 15 feet across much of the site, with the shoreline areas surpassing 18 feet. For a Category 4 surge, water levels would rise above 20 feet, with a few higher elevation areas in HCF exceeding 18 feet. Under a Category 5 surge, water levels would exceed 20 feet throughout the site.

These maps highlight that storm surge is not confined to beachfront areas, extending well inland. NOAA, through the National Weather Service's (NWS) National Hurricane Center (NHC), utilizes the Sea, Lake and Overland Surges from Hurricanes (SLOSH) model to simulate storm surge from tropical cyclones. The maps illustrate potential flooding scenarios but do not consider erosion, subsidence, sea level change, or future development.

Precipitation Event

The 25-year, 24-hour precipitation event is significant because it represents a rainfall event with a 4% chance of occurring each year, making it a standard measure for designing infrastructure (NOAA, 2013). It helps assess flood risk, ensure adequate stormwater management systems and guide infrastructure resilience against significant rainfall. This threshold is commonly used in planning and regulations to ensure that sites can handle extreme, but not rare, weather events without significant flooding or damage.

Using the map, it is possible to pinpoint areas that may receive more or less rainfall, which is important for managing stormwater, assessing flood risks and planning infrastructure. The isohyetal lines represent areas with the same amount of rainfall, allowing for a clearer understanding of how rainfall patterns vary across the region.

The area of interest associated with this project falls within the 9-inch rainfall band on this type of isohyetal map, meaning that during a 1-day storm event with a 25-year return period (i.e., an event that has a 4% chance of occurring in any given year), the area is expected to receive a total of 9 inches of rainfall (App. A, Figure 17). For stormwater management and flood risk planning, Mayport would need infrastructure designed to handle large amounts of water, as 9 inches of rain in a short period could lead to significant runoff, localized flooding and drainage challenges due to excess pressure on existing stormwater infrastructure.

Plant Communities

Characterizing plant communities is essential for understanding the plant communities present at a site, including both native and non-native species. The plant communities can serve as indicators of soil health, environmental conditions, the success of indigenous and introduced plants, successional stages and overall site function.

The project area consists of five categories of wetland vegetation, with three additional types found in surrounding areas (App. A, Figure 18). The majority of the stretch along A1A, from the Coast Guard Station to the end of Helen Cooper Floyd Park, is classified as Uplands vegetation. This habitat supports drought-tolerant species such as sand live oak (*Quercus geminata*), saw palmetto (*Serenoa repens*), wax myrtle (*Morella cerifera*) and wild rosemary (*Ceratiola ericoides*).

Within the grant's area of interest (as defined in the map set), the shoreline along the St. Johns River is primarily classified as Tidal Flat vegetation. This zone includes algae and occasional mangroves in low-energy wave environments, with species such as shoal grass (*Halodule wrightii*) and widgeon grass (*Ruppia maritima*). These plants provide essential habitat for marine life by stabilizing sediment and supporting aquatic ecosystems.

On both sides of Helen Cooper Floyd Park, Shoreline and Beach vegetation is present, consisting of species adapted to salt spray, shifting sands and high winds. Common dune stabilizers in this area include sea oats (*Uniola paniculata*), beach morning glory (*Ipomoea imperati*), railroad vine (*Ipomoea pes-caprae*) and seaside goldenrod (*Solidago sempervirens*).

Where Chicopit Bay meets the site on the southern side of Helen Cooper Floyd Park, Spartina alterniflora Marsh vegetation dominates. This habitat is characterized by smooth cordgrass (*Spartina alterniflora*), a species that thrives in brackish conditions and periodic flooding. These plants play a crucial role in stabilizing sediment and supporting coastal ecosystems by providing habitat for wildlife and improving water quality.

The final category of Wetlands Vegetation found on-site is High Meadow, located along the Chicopit Bay adjacent edge of Helen Cooper Floyd Park. This habitat features grasses and wildflowers that thrive in dry, well-drained soils, including little bluestem (*Schizachyrium scoparium*), Indian grass (*Sorghastrum nutans*) and goldenrod (*Solidago spp.*).

In surrounding areas, additional vegetation types include Transitional Shrub, Juncus roemerianus Marsh and Salt Flat communities. Transitional Shrub vegetation includes salt-tolerant species such as marsh elder (*Iva frutescens*), wax myrtle (*Morella cerifera*) and saltbush (*Baccharis halimifolia*). Juncus roemerianus Marsh is characterized by black needlerush (*Juncus roemerianus*), a species that thrives alongside Spartina marshes due to its high tolerance for brackish and saline conditions.

Soil Series

There are two types of soil present at our site, Arents and Tisonia mucky peat (App. A, Figure 13). The data presented was sourced from the Web Soil Survey (Web Soil Survey, 2019). Understanding the soil types and their hydrologic characteristics is essential for resilient, effective land management and landscape design.

The Arents soil category falls under Hydrologic Soil Group A, indicating a high infiltration rate and low runoff potential when thoroughly wet. These soils are typically deep, well-drained to excessively drained and often gravelly sands. With a high rate of water transmission, they are commonly found in nearly level areas with minimal slope. The depth to the water table for Arents soils ranges from 1.5 to 6 feet, with flooding being a rare occurrence.

The second soil type, Tisonia mucky peat, belongs to Hydrologic Soil Group D, which is characterized by a very slow infiltration rate and high runoff potential. Soils in this group generally consist of clays or have a shallow water table, a near-surface clay layer, or shallow depth over nearly impervious material. Tisonia mucky peat soils are typically found in flat areas with 0 to 1 percent slope and are subject to very frequent flooding lasting 4 to 48 hours.

Community Feedback

As part of the ongoing input conducted by the Carl Vinson Institute of Government, a two-part community assessment was administered in the fall of 2024 to gather community input for the project's design development (Carl Vinson Institute of Government, 2024). The first data collection phase occurred at the project site, Little Jetties, where team members distributed iPads preloaded with the community assessment. Participants, all site visitors who volunteered, were provided with the assessment link to take independently, with the option to provide open-ended responses in writing if they chose. The second phase involved door-knocking, where similar questions were asked to engage additional community members and collect further qualitative input.

In total, 41 responses were collected (App. B). The results offer qualitative insights intended to inform design alternatives rather than provide quantitative data. The feedback provides valuable insight into the community's views, preferences and experiences. Although the findings represent a small portion of the population, their inclusion helps shape early design concepts to be better aligned with community needs than would be possible without any data.

The proposed concepts developed from the community input data are preliminary and will be responsive to community feedback. They're intended to serve as a base for future community engagement with the potential to continue refining based on feedback. This process allows the community to review initial materials, engage with the reasoning behind design concepts and provide additional input based on their experiences with the site and community needs.

Various scenarios will be explored throughout the iterative process to ensure the alternatives optimally align. with community priorities and meet the grant's requirements. This approach allows the designs to evolve directly from the community feedback. In the event that the existing, ongoing project progresses to incorporate further community feedback, including the potential for co-design, a design foundation based on initial community input will be ready for continued development.

CHAPTER 4

RESULTS

Six design alternatives were formed in response to the inventory mapping process, data analysis and synthesis of community input. The results summarize community feedback, including opinions and preferences on visitor visitation frequency, recreational and social engagement, overall satisfaction and coastal erosion. Based on community knowledge and preferences integrated with the best available scientific data, two overarching design concepts are proposed, with three supporting alternatives provided for each. A descriptive explanation of each concept and alternative will be provided, followed by an overview of the ranking system developed and utilized by the author to assess the strength and responsiveness of each design to the proposed design criteria.

Feedback Summary

The respondents were predominantly civilians unaffiliated with Naval Station Mayport, with 93% indicating no connection to the military. A few participants reported working on the base or being military dependents, while no respondents identified as active duty personnel or members of the reserves. The age distribution indicated an older population, with the most significant segments falling within the 55–64 (28%) and 45–54 (26%) age brackets. Individuals aged 25–34 and 35–44 represented smaller portions of the sample (14% and 12%), while no respondents were under 18. Respondents over the age of 65 accounted for 16% of the total.

Racial and ethnic diversity among participants was limited. Ninety-five percent identified as White, and only a small number reported multiple racial or ethnic identities. One respondent specified Creek Indian heritage. There was no representation from Black, Hispanic/Latino, Asian, or other commonly reported demographic categories. Regarding gender identity, 51% of respondents identified as male and 42% as female. A small percentage (7%) selected "Other" and provided non-traditional self-descriptions. No respondents identified as non-binary or chose to withhold a response.

The community input results indicate that the majority of respondents refer to the shoreline at the project site as "Little Jetties" rather than Helen Cooper Floyd Park (App. B). Two-thirds of respondents also reside in Mayport Village. Nearly one-third (29%) reported visiting the site several times a week, while another third (27%) visit only a few times a year. Other responses reflected varying visitation frequencies, from weekly visits to less than once a year.

Activities

Respondents were asked to select up to three activities they engage in when visiting the site. Of the 41 responses, 51% reported visiting the shoreline to spend time with friends, family, or colleagues. The second most common activity was fishing, reported by 44%, followed by wildlife watching (34%) and photography (29%). Other activities, with participation rates of 20% or lower, included lounging or sunbathing (20%), walking or jogging (17%), water recreation (10%) and swimming (5%). Notably, no respondents indicated they visit the site for biking.

Social Engagement

The assessment also asked about who visitors primarily engage in activities with at the project site, Little Jetties. Of the 41 responses, 12% reported visiting the site alone, while 34% said they typically visit with one other person. The majority, 54%, stated they engage in activities with a group of two or more people. When asked to rate their agreement with the statement, "This shoreline is a family-friendly space," 32% strongly agreed, 37% agreed, 24% disagreed and 7% strongly disagreed.

Overall Satisfaction

A total of 40 participants provided feedback on their general satisfaction with various aspects of the site, including natural beauty, noise levels, available shade, water quality, cleanliness of the shoreline and vegetation.

Regarding natural beauty, the majority of responses (45%) indicated satisfaction with the current conditions. When asked about noise levels, 45% of respondents reported being neither satisfied nor dissatisfied with the existing conditions. For shade availability, the largest group of respondents expressed a neutral stance, stating they were neither satisfied nor dissatisfied. In terms of water quality, the majority (47%) again expressed a neutral opinion, neither satisfied nor dissatisfied.

Concerning the cleanliness of the shoreline, 32.5% of respondents expressed dissatisfaction with the current state. Responses regarding the amount of vegetation were more varied. Of those who responded, 27.5% were dissatisfied, 25% were neither satisfied nor dissatisfied, 25% were satisfied, 17% were very dissatisfied and 5% were very satisfied.

Coastal Erosion

Participants were asked a series of questions about their familiarity with coastal erosion, their primary sources of information, their level of concern about the Little Jetties' shoreline and whether their concerns focused more on the shoreline, local infrastructure, or accessibility.

When asked about their level of concern regarding coastal erosion at Little Jetties, 44% of respondents said they were extremely concerned, citing serious and immediate risks to the Mayport community. The second most common response was somewhat concerned, with participants acknowledging the issue as a significant threat to the shoreline. Additionally, 12% reported being slightly concerned, recognizing the problem but not seeing an immediate impact on the community. Lastly, 5% said they were not concerned, believing coastal erosion was not a pressing issue for the area.

Regarding how their concern about coastal erosion has changed over the past five years, 46% of respondents said their concern had increased significantly, while 27% reported that it had increased slightly. Another 27% indicated no change in their level of concern. No participants reported a decrease in concern.

To assess visual awareness of erosion, participants were shown two Google Street View images of Little Jetties, one from 2013 and another from 2024 and asked to note changes in vegetation and land over time (Figure 3. Figure 4). When asked how these images affected their concern about coastal erosion, 66% said the images significantly increased their concern, while 22% said their concern had increased. Another 12% reported no change and no participants indicated that the images decreased their level of concern

Figure 3: 2013 Google Street View Image shown in Community Assessment (GoogleEarth 2013)

Figure 4: 2024 Google Street View Image shown in Community Assessment (GoogleEarth 2024)

In response to a question about potential damage to roads and shorelines, 38 participants shared their perspectives. Of these, 3% were significantly more concerned about road damage and 8% were somewhat more concerned about roads. The majority (61%) expressed equal concern for both roads and shoreline erosion, while 26% were significantly more concerned about the shoreline.

Lastly, when asked about coastal erosion's potential impact on their ability to travel to and from their homes in Mayport Village, 28 residents responded. 57% said they were very concerned, 29% were somewhat concerned, 7% were a little concerned and 7% reported not at all concerned.

Intervention Preferences

When asked to what extent they supported or opposed listed methods of prevention, 41 participants responded with 92.5% supporting or strongly supporting increasing resistance to erosion by planting trees and other vegetation. 78% of respondents supported or strongly supported building up the beach and dunes by bringing sand in. Encouraging conditions that will allow salt marshes to reclaim some areas on the shoreline was supported or strongly supported by 72.5% of participants. 67.5% support or strongly support promoting shoreline stability by limiting where driving and parking is allowed and 52.5% support or strongly support promoting vegetation regrowth by limiting recreational areas.

Structures

When asked about support or opposition of different shoreline stabilization methods, 85% of the 41 respondents somewhat or strongly supported the use of groin structures to reduce erosion on the shoreline, while 12% neither supported nor opposed. Concerning breakwater structures, 59% somewhat or strongly supported it while 12% neither supported nor opposed. The opposition of breakwater structures was greater at 27% than that of groin structures at 2%. The responses pertaining to seawalls or retaining walls were split more evenly with 37% somewhat or strongly supporting their use, 24% neither supporting or opposing and 39% somewhat or strongly opposing them. The final intervention mentioned was rock armoring. With

68% of participants somewhat or strongly supporting, 10% neither supporting or opposing and 22% somewhat or strongly opposing, the majority were supporting potential rock armoring to reduce erosion on the shoreline.

When asked how important different traits associated with the structures mentioned were, marine life habitat was noted as the most important. This was followed by blending in with the natural environment, providing additional fishing opportunities, not obstructing vehicle access and not being visible above the water line.

Analysis

Future landscape designs for the Lower St. Johns River South Bank will need to address shoreline erosion, which has significantly reduced natural barriers that once protected A1A and nearby infrastructure. Without intervention, erosion will continue to expose the roadway and recreational areas to damage from wave action, storm surges and tidal flooding. In future iterations, a design priority will be restoring the lost buffers by reintroducing salt marsh and dune systems to stabilize the shoreline and provide critical habitat. Native vegetation, such as smooth cordgrass in marsh areas and salt tolerant upland vegetation, should be planted to help trap sediment and slow erosion naturally. In areas where erosion is severe, using hybrid approaches to combine softer solutions like marsh restoration with targeted structural reinforcements such as strategically placed groins or rock armoring could prevent further land loss. This method does not completely cut off natural shoreline processes.

Soil and hydrology conditions at the site will play a significant role in shaping potential design alternatives. The site contains well-drained soil in some areas and poorly drained, flood-prone soil in others, indicating that stormwater management will be an important design consideration. Permeable pathways and parking areas can be used where the soil allows for good drainage. In low-lying areas, establishing and enhancing existing marsh could slow and filter runoff before it reaches the river. Elevated boardwalks may be utilized to provide access while reducing soil compaction and minimizing disturbance to sensitive marsh zones.

Community input responses suggest that the community sees the shoreline as more than a sandy riverfront space; it is a community gathering place for fishing, wildlife watching, and spending time with family and friends. Designs should reflect and enhance these existing uses while also addressing concerns expressed in the feedback. Many respondents expressed dissatisfaction with the cleanliness of the shoreline and the lack of shade. Future designs should incorporate intentionally placed waste receptacles. Shaded seating areas and tree plantings can be incorporated to provide relief from the sun without disrupting views or access. Since fishing is one of the most common activities at the site, designated fishing areas with better access will ensure minimal environmental impact. Incorporating signage into design alternatives would help visitors understand where certain activities are encouraged or restricted to protect vulnerable areas. Signage would additionally provide a venue to educate visitors to the site's history, restoration and ecological systems at play at the "Little Jetties".

Concerning potential structural interventions, community feedback suggests strong support for groins and rock armoring but mixed opinions on breakwaters and seawalls. Additionally, results reveal community support for upland and marsh vegetation and habitat enhancement. As indicated by the community feedback, future designs should focus on stabilizing the shoreline with natural solutions first, using structural elements only where necessary. For instance, breakwaters or oyster reefs could be placed offshore to reduce wave energy without disrupting views, while groins might be useful in areas where sand retention is a priority. Seawalls, if used at all, should be designed in a way that blends into the landscape rather than creating a hard, unnatural barrier. By proposing marsh creation and enhancement, designs would repair and rebuild the previously existing buffer while also providing essential habitat.

With increased risks of flooding and storm surge, the design must also be adaptable. Roads, multi-use trails and public spaces should be designed with water level fluctuations in mind. Elevated walkways, flood-tolerant plantings, infrastructure that can withstand periodic inundation and raising A1A are potential design elements that would prioritize adaptability and future resiliency. By proposing multi-layered buffer zones that combine marsh restoration with rebuilding, elevating, and planting the upland landscape along with programming vehicular and pedestrian circulation, runoff and floodwaters will have a greater chance of being absorbed before reaching critical infrastructure. As a result, these areas will sustain less damage and recover more quickly from flooding events.

Shared Features

In addition to re-envisioned programming, ecological enhancement and shoreline stabilization interventions remain a priority in each alternative. As each alternative includes similar combinations of natural infrastructure interventions, they will be mentioned here prior to exploring the subsequent alternatives and their unique features (Table 2).

Breakwater structures are proposed in the most vulnerable areas near the Coast Guard station to reduce wave energy and provide a protective barrier between the water and A1A. Each design layers breakwater structures, marsh creation, indigenous vegetation plantings and ecological enhancement interventions for the health of existing oysters and other wildlife. Near Helen Cooper Floyd Park, marsh creation and enhancement efforts would further strengthen shoreline stability, with flood-tolerant vegetation in lower-lying areas and drought-resistant species planted in higher elevations along A1A.

Concept 1

The first design concept prioritizes integrating the existing A1A rather than introducing major structural interventions to the land portion of the design (see Appendix C for design alternatives). This approach maintains A1A's existing alignment and elevation, airfield access points and makes selective adjustments to site elevations and spaces based on proposed elements to meet the project's environmental and social goals. By minimizing large-scale structural interventions, this concept is likely to gain support from key stakeholders such as the Navy, Florida Department of Transportation, the City of Jacksonville and the Mayport Village community.

Although the first concept primarily works within the existing "Little Jetties" layout, it still incorporates intervention methods to mitigate the impacts of wave action, storm surges and tidal flooding. The proposed alternatives within this concept consider public recreation preferences while exploring less intrusive parking solutions to reduce stress on the shoreline and sandy soils. Each alternative offers site specific interventions, which vary in intensity and focus depending on the challenges being addressed. Overarching concepts with subsequent alternatives will provide project partners with multiple options based on project priorities. Based on this method, stakeholders will be able to select design interventions that best align with community goals and project objectives.

Concept 1 Alternative 1

The first design concept takes a minimal intervention approach, incorporating natural solutions, reconfiguring site programming and relocating parking to reduce stress on the "Little Jetties" vulnerable shoreline (App. C, Figure 21). A key feature of this design is the introduction of parallel parking spaces along A1A before visitors reach the Little Jetties (Figure 5). From this parking area, a multi-use path provides pedestrians and cyclists with direct access to Helen Cooper Floyd Park through the Marsh Overlook and other connected pathways. This path extends through the Little Jetties' sandy beach portion, connecting visitors to designated fishing access points. Access locations were identified through on-site observations and historical aerial imagery to ensure they best serve visitor use patterns.

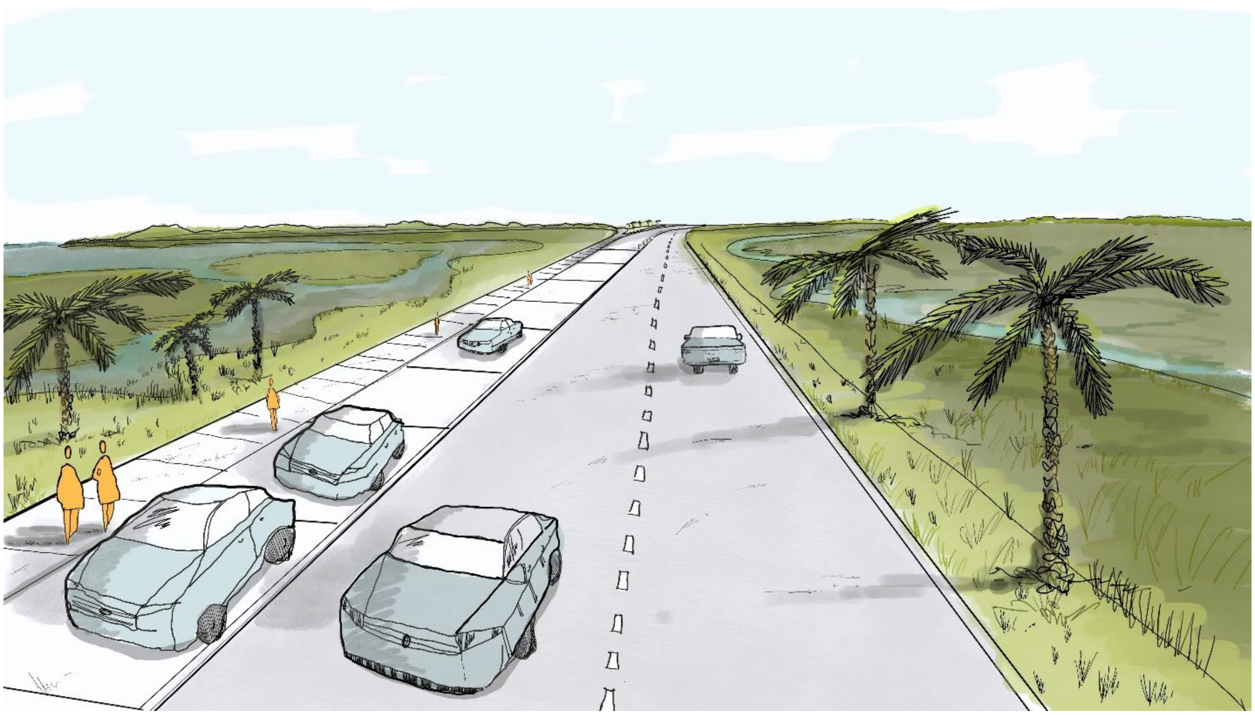

Figure 5: Concept 1 Alternative 1 Parallel Parking (Dingley 2025)

The parking spaces along A1A are designed to accommodate both standard vehicles and larger ones, such as campers, to accommodate the variety of vehicles observed on-site during the Fall 2024 site visit to Mayport. The central shoreline stabilization intervention in this design is reestablishing the shoreline curve along the St. Johns River between Helen Cooper Floyd Park and the Coast Guard Station. The shoreline previously acted as a natural buffer and has been lost due to wave energy, storm surge and tidal flooding. By restoring a more expansive sandy beach, the shoreline can act as a protective buffer for A1A and the surrounding recreational areas.

The design proposes strategically placed breakwater structures in the St. Johns River parallel to the shoreline to further stabilize this critical stretch. These structures will include the potential for living breakwaters and are designed to slow wave energy before it reaches the beach while remaining outside the shipping channel boundaries. The addition of breakwaters with sediment deposition will rebuild the shoreline and the buffer to protect A1A.

Concept 1 Alternative 1 improves pedestrian safety and connectivity while meeting baseline goals of community feedback and the grant priorities. By keeping parking off the beach outside the curve of A1A, the plan enhances traffic safety for drivers and pedestrians while preserving the vulnerable shoreline. Proposed indigenous vegetation along the multi-use path, shoreline and throughout Helen Cooper Floyd Park will create vegetative buffers that enhance the site's biodiversity, provide another layer of erosion control and improve the site's aesthetic appeal.

Despite its strengths, this concept has some limitations. Although it aligns with community preferences by moving parking away from the sandy portion of the Little Jetties, it does not introduce new programming elements that fully capitalize on the site's ecological and scenic value. Removing parking from the most desired beach access point could face pushback from long-time visitors accustomed to driving directly onto the sand. In the past, some visitors have parked for the day or even camped on the beach and while restricting vehicle access is necessary to protect the shoreline, the displacement of parking may be met with resistance from those who prioritize the convenience of direct access.

Concept 1 Alternative 2

The second proposed alternative for Concept One is to relocate parking to be adjacent to the marsh at Chicopit Bay, bringing visitors closer to the sandy beach and Helen Cooper Floyd Park at the Little Jetties (App. C, Figure 22). Although it shares many design elements with Concept 1 Alternative 1, Alternative 2 emphasizes programming and improving access to Helen Cooper Floyd Park. A1A remains at its existing elevation, with a multi-use pedestrian path running alongside it, weaving through the marsh and Little Jetties area before reaching the Chicopit Bay overlook. The path continues past the designated parking area at Little Jetties and extends to fishing access points along the shoreline. To compensate for the reduced parking capacity at the sandy beach location, an overflow parking area is proposed at the end of the multi-use path and across from the Coast Guard station, providing additional spaces for visitors. A pedestrian connection across A1A ensures safe access between the pedestrian path and overflow parking areas.

A key difference between this design and the previous alternative is that parking is placed on sandy soil at Little Jetties. However, a physical barrier is included to prevent vehicles from leaving designated areas. The programmed parking area maintains a gradual slope from the peak elevation of A1A, with a 3 to 4-foot retaining wall separating the parking lot and the sandy shoreline. This feature prevents cars from driving onto the beach, reducing the impact of vehicle traffic on the already vulnerable and eroding shoreline.

A marsh boardwalk and overlook are proposed to enhance visitor experience, promote engagement with the site's ecology and provide educational signage about on-site shore stabilization methods. The boardwalk and overlook connect the pedestrian path along A1A to the main road leading into Helen Cooper Floyd Park. The parking lot also functions as a service road for emergency vehicles, with removable bollards allowing pedestrian access when vehicular access is not needed. All parking areas and pathways are designed to be ADA-accessible.

Primary advantages of this design include keeping new infrastructure to a minimum, improving connectivity and keeping vehicles off the most sensitive portions of the beach. Providing programmed parking in areas where visitors already park reduces the impact on sandy spaces and maintains access to popular destinations, including A1A, Helen Cooper Floyd Park and the Little Jetties sandy shoreline.

The limited on-site parking may be a concern for some community members. Although the design reduced vehicular access to the beach, a small portion of the sandy area is being impacted by parking. By positioning cars adjacent to the marsh, stormwater runoff and other potential contaminants may affect marsh health. Despite these potential issues, this alternative supports convenient visitor access and offers a practical approach to managing visitor impact while protecting the shoreline.

Concept 1 Alternative 3

The third design alternative under Concept One maintains A1A at its current alignment and elevation while maximizing on-site parking near the sandy beach portion of the Little Jetties (App C. Figure 23). Unlike the previous alternatives, this design accommodates approximately 25 or more pervious parking spaces along the A1A curve, incorporating a backup and merge lane adjacent to the roadway. The designated parking area starts at the same elevation as A1A and gradually inclines before transitioning into a walkway, bioswale and a retaining wall that separates the parking area from the beach (Figure 6). This elevation change is an intentional design feature that prevents vehicles from driving onto the sand and exacerbating existing erosion issues. While this approach is not as minimal as the other two alternatives, it focuses on integrating low-impact development (LID) features to balance vehicular access, ecological preservation and overall visitor experience.

Figure 6: Concept 1 Alternative 3 Parking Area (Dingley 2025)

Incorporating vegetated parking islands with curb cuts to capture stormwater reduces runoff and breaks up the paved areas to minimize soil compaction. The parking islands provide space for plant growth between parking spaces, helping to stabilize soils. A central designated beach access point runs through the middle of the parking area, providing a safe and direct route from parking to the beach access. Two additional pathways extend from the parking area to the beach and other walkways. These paths accommodate the site's elevation changes, which vary from 2.5 to 4 feet depending on location. Near the marsh overlook and service road into Helen Cooper Floyd Park, an ADA-compliant ramp and landing platform ensure that all visitors have safe access to the park and its network of trails.

To further reduce the impact of increased parking, Alternative 3 incorporates pervious surfaces such as permeable pavers or true grid systems to allow for natural stormwater infiltration. Additionally, a bioswale is positioned between the pedestrian path and the retaining wall to capture runoff, filter pollutants and stabilize soil with vegetation. The primary beach access includes stairs to navigate the change in elevation. Along A1A, a vegetative buffer serves as an additional barrier to vehicles and erosion while enhancing biodiversity and adding to the site's beauty. As in the previous alternatives, this design integrates a service access road into Helen Cooper Floyd Park. A row of removable bollards separates the access road from pedestrian areas, allowing emergency vehicles to pass through while keeping non-emergency vehicles out.

The marsh overlook platform, accessible from the pedestrian path or the service road, offers views of the marsh and bay and serves as an additional fishing platform close to the parking area. An additional pedestrian path runs parallel to the main walkway and A1A to connect the designated beach access points, allowing visitors to move freely along the shoreline between fishing spots. The connected paths are exclusively accessible by pedestrians and cyclists to ensure safe and uninterrupted access to the shoreline.

Overflow parking and a trailhead across from the Coast Guard station provide additional parking for higher-traffic days. Similar to the Helen Cooper Floyd Park entrance, this trailhead includes trash receptacles, educational signage about local ecology and other amenity information. Beyond visitor amenities, this design incorporates layered ecological interventions to stabilize the shoreline and protect A1A. Breakwater structures, with the potential to serve as living breakwaters, are proposed along the most vulnerable section of the shoreline near the Coast Guard station. Further down the shoreline, beach nourishment and sediment deposition efforts will widen the beach and create a larger buffer between the St. Johns River and essential infrastructure. Surrounding the proposed beach nourishment area, new marsh creation zones will reinforce the shoreline's natural defenses. Re-establishing the marsh platforms will increase sediment retention, provide additional habitat for marine life and effectively stabilize the shoreline.

This design offers multiple advantages. Of the three alternatives under Concept One, it provides the most on-site parking and shoreline stabilization interventions. It incorporates indigenous vegetation, pervious surfaces, bioswales and other stormwater management solutions to help mitigate the ecological impact of increased parking area. By moving parking away from the bay, it reduces the risk of direct stormwater runoff contaminating the marsh as well.

The limitations of this alternative encompass the area of sandy soils it occupies. To accommodate standard parking stall sizes, a merge lane and pedestrian pathways, this design occupies more of the sandy area at the Little Jetties adjacent to A1A than in the previous two alternatives. By placing new infrastructure on sandy soils, additional erosion is a potential issue if wave energy reaches the parking area, impacting overall long-term shoreline stability. Despite the cons associated with this alternative, it is the most comprehensive of the three and directly addresses community concerns and grant priorities.

Concept 2

The second concept focuses on raising the elevation of A1A and modifying its alignment to ensure long-term protection of the primary access route into Mayport Village and the naval base. Elevating A1A extends the lifespan of the road by positioning it above predicted future sea levels, tidal fluctuations and storm surge threats. The alternatives within this concept utilize the existing A1A footprint for mixed-use programming. Rather than abandoning the current roadway alignment, the proposed alternatives integrate it into each design to provide additional access and recreation.

Natural infrastructure elements are incorporated into each plan to reinforce the St. Johns River shoreline, ensuring that erosion control, habitat enhancement and flood mitigation remain top priorities. While many of the intervention methods mirror those outlined in Concept One, their interaction with the landscape changes in response to A1A's elevated positioning and realigned path.

Concept 2 Alternative 1

Concept 2 Alternative 1 mirrors the parallel parking alternative from Concept 1 but adapts it to accommodate the realigned and elevated A1A (App. C, Figure 24). This design begins to divert A1A north of the bridge crossing at Sherman Creek, where the existing and new alignments split. The current A1A remains in place and is repurposed as a pedestrian and cycling path, while the newly elevated A1A gradually diverges and follows a broad curve that directs traffic toward Chicopit Bay. The new alignment complies with Federal Aviation Administration (FAA) requirements (FAA, 2022). The raised roadway allows for 12 feet of clearance below and an additional four feet of decking, which places the new road surface at approximately 16 feet above the existing grade. The alignment was designed using a 50:1 clearance ratio for the Mayport airfield, requiring the new A1A to be positioned far enough away to accommodate a total vertical clearance of 30 feet, accommodating the new infrastructure height as well as large trucks and 18-wheelers.

Parallel parking is incorporated along the raised A1A in straightaway sections to ensure safety and maximum visibility. Placing parking in the tangential sections of the new alignment promotes safety by minimizing conflicts between vehicles and pedestrians. The proposed placement additionally reduces the risk of blind spots, which increases driver awareness. Designing parallel parking at the same elevation as the elevated alignment eliminates the need for additional access ramps or merge lanes. This maintains a safe traffic flow while allowing visitors to park and access the existing A1A via ADA-compliant ramps.

The parking areas and ramps are designed with a 3.3% slope to meet accessibility standards (less than 5% longitudinal slope) and offer pedestrians a safe and smooth transition (Americans With Disabilities Act, 1990). Access ramps from parking areas on either side of the main curve lead to the multi-use pedestrian and bicycle path that follows the footprint of the existing A1A and connects visitors to popular Little Jetties spots. Connectivity is a primary factor of this design. In addition to repurposing the existing A1A as a pedestrian and cycling corridor, a secondary pathway links the site to Helen Cooper Floyd Park, beach access points and a new trailhead with overflow parking across from the Coast Guard station. This allows visitors to move between favorite destinations without relying on vehicular access.

As in other alternatives, ecological interventions remain a core component of this plan. This alternative proposes beach nourishment and strategically placed sediment deposition to reinforce the shoreline. By placing sediment along diminished shoreline areas, pedestrian paths that extend along the St. Johns River can wind between restored vegetation and designated fishing access points. Due to these shoreline stabilization elements, breakwater structures must be repositioned further into the river to account for the newly placed sediment, requiring careful consideration of distance to shipping channel boundaries.

Concept 2 Alternative 1 offers several advantages. Raising A1A provides a long-term solution to flooding and periodic inundation, ensuring that residents will consistently be able to safely access their homes and resources in Mayport Village. It also repurposes the existing A1A footprint to create a continuous and accessible multi-use pedestrian path that increases connectivity across the site. This alternative additionally removes vehicles from the beach entirely by raised parallel parking, reducing erosion while still allowing for visitor access. Layered natural infrastructure elements such as breakwaters, sand deposition and increased indigenous vegetation rebuild natural buffers. Together, these methods enhance the shoreline's stability along with visitor programming aimed at keeping foot traffic in vulnerable areas to a minimum.

Likewise, there are potential challenges with this alternative. Parking along the elevated A1A may feel less accessible due to its immediate proximity to traffic moving at speeds of 35-40 mph, with no dedicated acceleration or deceleration lanes. Although parking is placed in straightway stretches along the alignment for this reason, this could create safety concerns. Community feedback may also reflect dissatisfaction with the removal of parking from the sandy beach area because it would require visitors to park on the elevated causeway and transport their belongings down ramps and along pedestrian paths. This design is costlier than the previously proposed alternatives due to the elevation and realignment of A1A. This may prove to be less favorable among stakeholders and project partners due to increased costs, permitting and potential project timeline delays.

For this design to be realized, the existing airfield check-in points would need to be relocated. The entrances are currently accessible by the existing A1A, but without access ramps, there would be no way for visitors to access these critical points. The design proposes relocating parking near the Coast Guard station, which would be immediately adjacent to the airfield and accessible by at-grade entrances. Land ownership and usage uncertainties may complicate this proposed move.

Concept 2 Alternative 2

Concept Two Alternative 2 relocates parking beneath the newly raised A1A, distinguishing it from the Concept 1 Alternative 1, which is the only raised option that provides parking at the same elevation as the elevated causeway (App. C, Figure 25). This design allows visitors to enter Mayport across from the Coast Guard station and loop down below the raised A1A to the footprint of the existing roadway. Parking is positioned on the tangential portion of A1A, past the airfield check-in points and between the sandy portion of Little Jetties beach. This approach eliminates the need to relocate the airfield check-in points, as required in Alternative 1 and it removes parking from the sandy beach while keeping it close enough for easy pedestrian access via dedicated pathways.

The parking layout includes 90-degree nose-in spaces with designated ADA-accessible spots. A hammerhead turnaround is placed at the end of the lot, with bollards installed along two sides to prevent vehicles from driving onto the beach or using the lot as a throughway. These bollards can be removed when emergency or service vehicles require access to the lower portion of A1A and Little Jetties Beach or Helen Cooper Floyd Park via the proposed service road.

Figure 7: Concept 2 Elevated A1A (Dingley 2025)

The raised portion of A1A begins further down the road after the bridge crossing, diverging from the existing alignment at a later point than in Alternative 1 (Figure 7). While the new A1A follows a broad curve designed for safe vehicular travel, the bike and pedestrian multi-use path branches off from the existing A1A before the elevation change begins. A clearly marked exit lane transitions cyclists and pedestrians from the vehicular portion of A1A onto the multi-use path, signaled by a buffer zone between two rows of bollards. Once past this transition area, pedestrians and cyclists follow the repurposed A1A footprint, leading them to key destinations such as Helen Cooper Floyd Park, the sandy portion of Little Jetties Beach and a restored marsh area near the Coast Guard station.

This design presents several benefits. Raising A1A ensures long-term continuous and protected access to Mayport Village despite potential storm surges or tidal flooding. By placing parking on the existing A1A footprint beyond the airfield access points, this alternative avoids disrupting airfield operations and minimizes the expense of relocating entrances and access points. The integration of parking and pathways improves pedestrian and cyclist accessibility, allowing visitors to easily reach their destinations from either direction along the existing A1A. By relocating parking closer to the beach and moving the majority of programming away from the most vulnerable shoreline near the Coast Guard station, this alternative creates space for marsh platform restoration and reestablishment.

Several nature-based strategies from Concept 2 Alternative 1 and previous alternatives in Concept 1 carry over to this design. These include vegetative buffers, indigenous plantings in both flood-prone and drought-prone areas, marsh creation and strategic sediment deposition. An additional feature proposed in this design is the intentional break in the existing A1A along Chicopit Bay, where a pedestrian bridge replaces the roadway (Figure 8). This supports hydrological connectivity between the bay, nearby streams and wetland areas, improving marsh health and expanding habitats for vital species such as the established oysters in Chicopit Bay.

These ecological enhancements provide a natural buffer, helping to slow wave energy and absorb flooding before it reaches critical infrastructure. Similar to the other alternatives, this design incorporates breakwater structures near the Coast Guard station to reinforce the shoreline by pairing hard structural elements with marsh restoration efforts. These combined interventions create a layered approach to erosion control and shoreline stabilization that aligns with grant priorities.

Despite the pros, this alternative has potential cons as well. Raising A1A and constructing a new alignment requires significant costs, which could negatively impact stakeholder and project partner support. Another drawback might be the limited vehicular access along the existing A1A. The parking layout and service road separation could create potential conflicts between drivers and pedestrians if not carefully programmed for safety. Visitors are in the habit of driving on the entirety of the existing A1A footprint and this alternative limits vehicular traffic midway along the route. Concerning cycling safety, the repurposed A1A multi-use bike path narrows significantly from 24 feet to a new 12 feet wide trail to accommodate parking on the A1A footprint while maintaining connectivity. This could create unsafe conditions for cyclists as the trail transitions between different widths. Lastly, although the new parking location is closer to Little Jetties Beach than in the previous, it may still be perceived as too far from the shoreline, leading to potential community pushback.

Concept 2 Alternative 3

Concept 2 Alternative 3, the final design alternative, raises A1A and integrates key elements from previously proposed raised and at-grade alternatives to maximize overall benefits and user experience (App. C, Figure 26). This alternative offers infrastructure protection against future sea level rise, storm surge and periodic inundation while also addressing immediate concerns such as vehicular impact on the sand and the need for improved site programming.

The new A1A alignment again diverges from the existing roadway just after the last bridge crossing leading into Mayport Village, though it is positioned farther back than in Alternative 1 and in the same position as in Alternative 2. It follows the widest curve of all the proposed alignments and gradually rises at a gentle 3% slope to reach its target elevation. To enhance safety for pedestrians and cyclists, the previously proposed gradual turnoff is redesigned into a more intentional and direct intersection, separating non-vehicular traffic before the incline begins. Flashing signals and other design elements indicate the transition, leading pedestrians and cyclists toward an overlook with views of nearby streams and wetlands. From this overlook, a subtle winding path connects to the existing A1A footprint, guiding visitors along the multi-use trail toward other parts of the design.

Figure 8: Concept 2 Alternatives 2 and 3 Pedestrian Bridge (Dingley 2025)

Similar to Concept 2 Alternative 2, this alternative breaks up the existing A1A footprint at Chicopit Bay and adds a pedestrian bridge to replace the existing segment (Figure 8). This feature improves hydrological connectivity between the bay, its adjacent wetlands and surrounding streams and supports marsh enhancement efforts by allowing for expanded habitat for water-loving plants like *Spartina* and key species such as oysters.

Additionally, similar to Concept 2 Alternative 2, this design directs visitors into the town of Mayport before guiding them below the raised A1A to parking and the beach access. By doing this, this design improves traffic circulation and enhances safety for both residents and visitors. Across from the Coast Guard station, an access ramp leads vehicles below the elevated roadway onto the existing A1A footprint. Drawing on elements from Concept 1 Alternative 3, parking is relocated to the sandy shoreline portion of the Little Jetties, maximizing parking capacity and maintaining airfield access points in their current locations. This placement makes the beach more accessible to visitors while also providing a direct route into Helen Cooper Floyd Park.

In this design, the existing A1A footprint is split into two distinct sections. The portion extending from Mayport Village to Chicopit Bay remains open to vehicular access, supporting parking and circulation. However, the segment beyond Chicopit Bay, which connects back to the original A1A alignment, is converted into a pedestrian and cycling corridor until the bridge crossing South of the Little Jetties. To accommodate the split between the repurposed A1A and the designated parking area, a proposed alternate multi-use path continues beyond the parking area along the shoreline, connecting the spaces and providing continued pedestrian access into Mayport Village.

Shoreline stabilization measures mirror those in the previous two raised-roadway designs. Breakwater structures, to be further refined in future design phases, are paired with marsh creation and restoration adjacent to the Coast Guard station. By relocating parking farther down the shoreline, as in Concept 1 Alternative 3, this design alleviates pressure on the most vulnerable portion of the site, allowing for increased ecological intervention. Beach nourishment and sediment deposition are proposed at the Little Jetties Beach to recover lost shoreline and mitigate ongoing erosion. Marsh creation and enhancement efforts extend along both sides of the access road into Helen Cooper Floyd Park to absorb wave energy, slow tidal flooding and provide an additional erosion buffer.

This alternative offers several advantages. By removing parking from both the existing and raised A1A alignments, it offers maximum safety and improves vehicular and pedestrian traffic flow. Redirecting vehicles away from the vulnerable shoreline area near the Coast Guard station reduces infrastructure stress and provides additional opportunities for marsh restoration. Another pro of this design is that parking is relocated closer to popular site destinations such as Helen Cooper Floyd Park and the sandy beach at the Little Jetties. The elevated and realigned A1A option takes inundation risks into consideration and guarantees long-term safe access to Mayport Village for commuters and residents. Lastly, in responding to community concerns, this design introduces the option to restrict vehicular access after hours by controlling access to the lower A1A parking area.

Disadvantages to consider with this alternative are the cost and environmental disruption associated with raising A1A and constructing the new causeway. Such factors may affect stakeholder acceptance and disrupt the project timeline and overall feasibility. Relocating parking to the beach presents concerns about potential impacts on shoreline stability, as mentioned in Concept 1 Alternative 3, despite the additional erosion control measures to mitigate the effects of the proposed parking. Compared to the other alternatives, this option designates the least amount of the existing A1A footprint to pedestrian and cyclist use. A larger portion is allocated to vehicular circulation and parking access compared to the previous two alternatives within Concept 2.

Helen Cooper Floyd Park

A design element common to each concept and alternative is the proposed trail system. Consisting of 6 and 8 ft wide paths, a multi-phased trail system is proposed to enhance circulation and connect visitors to their favorite park sites. The trail system consists of 3 connecting paths that can be implemented in three successional stages if need be. The first trail, the 'St. Johns River Trail', is 3,910ft in length and guides visitors along the park's edge following the St. Johns River before reaching the end and looping back around. The second phase, 1,867ft in length, closely follows the existing footpath but connects to the first phase trail. The third phase, the 'Chicopit Bay Boardwalk', is 3,827 ft in length and consists of a mixed boardwalk and aggregate path that extends over the marsh and through the present ecotones. The path incorporates 3 marsh overlooks for visitors to enjoy wildlife viewing and optimal viewsheds. The trails are intended to bring programming that builds off the park's existing beauty and functions. Incorporated indigenous vegetation and marsh enhancement are included in the design proposal to increase biodiversity, absorb wave energy and periodic inundation and add to the aesthetic appeal of the park.

Figure 9: Helen Cooper Floyd Park Trail System (Dingley 2025)

Rating System Explained

A relative ranking system was developed by the author to evaluate how well each design performed in different areas, helping the project team and stakeholders identify which solutions best responded to specific issues (Table 1). The rating system reflects the author's perspective and is not weighted and is intended to serve as straightforward communication tool to engage community members with basic understanding of which designs respond best to the provided categories according to the designer. A multi-criteria analysis was not performed on designs at this stage in the planning process, as the provided alternatives and communication methods are intended to be accessible as possible. However, in future project phases with informed and invested community members, assessing alternatives in a weighted manner through a multi-criteria analysis may be an option to understand effectiveness of the designs at a deeper level as needed.

The rating system assessed the strongest combinations of desirable design elements through presented design features and their associated metrics (e.g. area of marsh created, number of proposed parking stalls, number of vegetated parking islands with curb cuts, area of bioretention created, area of beach increase through sediment deposition, length of pedestrian trails created for connectivity and length of AIA repurposed for pedestrians and cyclists). There are nine categories or criteria used to assess each of the six design concepts.

Each concept was rated on a scale of 1 to 6 based on how well it met each criterion. For example, if Concept 1 Alternative 3 received three for a particular criterion, the other alternatives would receive a different number for that criterion, eliminating repeat rankings in that category. The ranking resets for each criterion, so every design gets a new rating for each category.

The overall strength of each design is determined by totaling the rating across all categories. The concept with the highest rating represents the strongest overall response to the proposed issues. The concept with the lowest rating still meets basic guidelines and some community preferences but does not address each issue as strongly. The higher the rating indicate a stronger alternative, while the lower the rating suggests a weaker response to the project's needs and guidelines.

Table 1: Alternatives Ratings in Response to Design Criteria

Criteria	***Concept 1 Alternative 1***	***Concept 1 Alternative 2***	***Concept 1 Alternative 3***	***Concept 2 Alternative 1***	***Concept 2 Alternative 2***	***Concept 2 Alternative 3***
Pedestrian and Bike Access	★	★★	★★★	★★★★★★	★★★★	★★★★★
Vehicle Access and Parking	★	★★★★	★★★★★	★★	★★★	★★★★★★
Visitor Experience and Amenities	★	★★★	★★★★★	★★	★★★★	★★★★★★
Ecological Enhancements	★	★★	★★★	★★★★	★★★★★	★★★★★★
Shoreline Stabilization (Parking Focus)	★★★★★	★	★★	★★★★★★	★★★	★★★★
Shoreline Stabilization (Total Design)	★	★★★	★★★★	★★	★★★★★	★★★★★★
Projected Cost Feasibility	★★★★★★	★★★★★	★★★★	★	★★	★★★
Response to Community Input	★	★★	★★★	★★★★	★★★★★	★★★★★★
Response to Grant Input	★	★★	★★★★	★★★	★★★★★	★★★★★★
Total	**18**	**27**	**33**	**30**	**36**	**48**

According to the rating system, Concept 2 Alternative 3 (48 total rating) emerged as the strongest design, responding most effectively to all criteria categories. Concept 2 Alternative 2 (36 total rating), Concept 1 Alternative 3 (33 total rating), Concept 2 Alternative 1 (30 total rating) and Concept 1 Alternative 2 (27 total rating) were rated similarly, meaning these alternatives addressed the criteria with comparable strength, each so in different ways. The lowest-ranked alternative was Concept 1 Alternative 1 (18 total rating). While this alternative would still meet the project goals, other options may better serve the community and project partners' interests. This rating system offers an accessible way for stakeholders and project partners to clearly see the differences between each concept alternative and how they align with the criteria. Additionally, this table serves as a helpful tool for future presentations to interested parties, new stakeholders, or potential funders, making it easier to communicate the strengths and trade-offs of each design

Assessing how well each design responds to the presented criteria depends on the strongest combination of design features and their associated metrics (e.g. area of marsh created, number of proposed parking stalls, number of vegetated parking islands with curb cuts, area of bioretention created, area of beach increase through sediment deposition, length of pedestrian trails created and length of AIA repurposed for pedestrians and cyclists) (Table 2).

Concept 1 Alternative 1 incorporates 2.75 acres of marsh, 8.1 acres of beach creation through beach nourishment and parking accommodations with 20 stalls provided in parallel parking bay 1 and 15 stalls in bay 2. Parking locations, however, are removed from beach access. This alternative does not offer marsh overlooks for wildlife viewing and does not repurpose any of A1A for pedestrians and cyclists. However, to maximize connectivity, the design alternative offers 4 designated fishing spots and adds 4,850 ft of pedestrian paths along the shoreline, connecting visitors to the Helen Cooper Floyd and parking amenities.

Concept 1 Alternative 2 offers the same addition of marsh and beach areas with 2.75 acres of marsh and 8.1 acres of beach creation through beach nourishment. Parking amenities are split between immediate beach and park access and overflow parking as visitors enter A1A with 8 standard and 1 ADA compliant stall on site and 13 standard and 1 ADA compliant stall offsite in the overflow parking bay. This alternative does not propose a bioretention area and does not repurpose any of A1A for pedestrian and cyclist use. However, this design offers 3,096 ft of created pedestrian paths to enhance connectivity, 1 marsh overlook for wildlife and scenic viewing and 4 designated fishing areas for recreational access.

Concept 1 Alternative 3 proposed 2.75 acres of marsh creation and 8.1 acres of beach creation through beach nourishment. This design proposed on and offsite parking options with 2 ADA compliant and 22 standard parking stalls on-site and 1 ADA compliant and 13 standard parking stalls off-site in the designated overflow parking. Unlike the previous two alternatives, this alternative creates 1,964 sqft of parking adjacent bioretention. This design, similar to other alternatives in this concept does not repurpose any of A1A for pedestrian and cyclist use. To enhance connectivity across the site, however, 3,096 ft of pedestrian paths are proposed. Additionally, for wildlife and scenic viewing, this design incorporates 1 marsh overlook and 4 designated fishing access areas.

Concept 2 Alternative 1 proposed the same marsh and beach creation metrics as Concept 1 Alternatives 1 and 2 with 2.75 acres of marsh and 8.1 acres of beach creation through beach nourishment. This alternative, similar to Concept 1 Alternative 1 proposed parallel parking bays in tangential areas adjacent to the curving portion of A1A that runs along the site. At the same elevation as the raised A1A, this alternative offers 22 parallel parking stalls in bay 1 and 36 in bay 2 with optional, in-town overflow parking. Parking stalls are offered on both sides of A1A. This alternative proposed 4,850 ft of the existing A1A footprint be repurposed for pedestrian and cyclist use. Although this design does not offer bioretention, it offers 1 marsh overlook for wildlife and scenic viewing, 4 designated beach and fish access areas and 3,096 ft of new pedestrian paths for enhanced circulation.

Concept 2 Alternative 2 adds 6.9 acres of marsh and 3.83 acres of beach access. Parking amenities include 2 ADA-compliant and 13 standard parking stalls on the existing A1A footprint with 1,785 sqft of adjacent bioretention and one vegetated parking island. Although parking is situated on the existing A1A's footprint, 3,023 ft is repurposed for pedestrian and cyclist use. An additional 2,716 ft of pedestrian paths, including a portion of the existing A1A replaced with a pedestrian bridge, are incorporated throughout the design to enhance pedestrian circulation and aquatic connectivity. A marsh overlook is included at the edge of Chicopit Bay for visitor enjoyment.

The final alternative, Concept 2 Alternative 3, ranked as the strongest design for the project's purposes. This is based on its metrics made possible by combing the strongest elements of other alternatives. Alternative 3 adds 7.5 acres of marsh and expands the beach area immediately adjacent to parking by 2.67 acres through beach nourishment. The parking bay is located off of the existing A1A footprint and is made accessible via access ramp from elevated and newly aligned A1A to existing A1A. Proposed parking includes 2 ADA-compliant and 22 standard parking stalls, an ADA access ramp and landing platform and 1,965 sqft of bioretention. Seven vegetated parking islands with curb cuts are distributed across parking stalls to mitigate compaction and capture stormwater runoff. Additionally, 2,391 ft of A1A is repurposed for pedestrian and cyclists and 4,418 ft new pedestrian pathways connect visitors to key site destinations, enhancing overall circulation. As in Concept 2 Alternative 3, a portion of the existing A1A is replaced with a pedestrian bridge to facilitate pedestrian connectivity and aquatic connectivity as well. Two marsh overlooks and boardwalk connectors are incorporated in the design to encourage wildlife and scenic viewing. The combination of strongest design elements from all designs, along with metrics to support the non-weighted rating, makes Concept 2 Alternative 3 the preferred design alternative.

Table 2: Design Alternatives Metrics Comparison

Metric	***Concept 1 Alternative 1***	***Concept 1 Alternative 2***	***Concept 1 Alternative 3***	***Concept 2 Alternative 1***	***Concept 2 Alternative 2***	***Concept 2 Alternative 3***
Marsh Creation (acres)	2.75	5.65	5.65	5.65	9.80	10.40
Beach Creation (acres)	11	8.1	8.1	8.1	3.95	2.79
Parking Stalls (Standard)	30 (parallel)	21	35	48 (parallel)	13	22
Parking Stalls (ADA)	4	2	3	4	2	2
Vegetated Parking Islands	0	0	7	0	1	7
Bioretention Area (sq ft)	None	None	1,964	None	1,785	1,964
Pedestrian Pathways (lf)	4,850	3,096	3,096	3,096	2,716	4,418
A1A Repurposed for Pedestrians /Cyclists (ft)	None	None	None	4,850	4,850	2,391
Fishing Access Points	4	4	4	4	4	4
Marsh Overlooks	1	1	1	1	1	2
Pedestrian Bridge	None	None	None	None	Yes	Yes

CHAPTER 5
DISCUSSION

This chapter will discuss the preferred alternative that resulted from the alternatives analysis and examine the design alternatives' advantages and disadvantages that supported the selection. The discussion will include the processes explored to accomplish project objectives and how materials can be utilized for future co-design sessions with the Mayport community to guide site programming. Challenges such as gaining a deeper understanding of NbS to ensure effective and appropriate application were a central part of the process. Informative and accessible guides played a crucial role and will remain essential for educating and communicating concepts in future community engagement phases. The discussion will conclude with lessons learned and their implications for integrating project materials into future opportunities with the Mayport community.

Design Alternatives

The design alternatives are intended to remain on hand as reference materials to guide future stages of the design process and support upcoming design sessions as needed. The broader, ongoing project, led by the Carl Vinson Institute of Government in collaboration with other partners through the National Fish and Wildlife Foundation, aims to more directly address the most critical project areas, particularly the vulnerable shoreline along A1A adjacent to the Naval Station Mayport gate.

This thesis expands beyond the grant's original area of interest by including a longer stretch of A1A, as well as Helen Cooper Floyd Park, in order to approach the site from a systems perspective. This broader scope allows for a more comprehensive set of nature-based infrastructure strategies focused on shoreline stabilization and enhanced pedestrian and visitor experience. As the larger project moves forward, public engagement efforts will have the opportunity to respond to the selected preferred alternative. These conversations can build on the concepts developed here, using the frameworks introduced in the literature review to inform and inspire future co-design work.

Concept 1 Alternative 1

Concept 1 Alternative 1 improves pedestrian safety and connectivity and meets baseline goals of community feedback and the proposed grant goals (Table 3). By keeping parking off the beach outside the curve of A1A, the plan enhances traffic safety for drivers and pedestrians while preserving the vulnerable shoreline. Community feedback revealed the relocation of parking was widely accepted if shoreline integrity would be protected as a result. Proposed indigenous vegetation along the multi-use path, shoreline and throughout Helen Cooper Floyd Park will create vegetative buffers that enhance the site's biodiversity, provide another layer of erosion control and improve the site's aesthetic appeal.

Despite its strengths, this concept has some limitations. Although it aligns with community preferences by moving parking away from the sandy portion of the Little Jetties, it does not introduce new programming elements that fully capitalize on the site's ecological and scenic value. Removing parking from the most desired beach access point could face pushback from long-time visitors accustomed to driving directly onto the sand. In the past, some visitors have parked for the day or even camped on the beach and while restricting vehicle access is necessary to protect the shoreline, the displacement of parking may be met with resistance from those who prioritize the convenience of direct access.

Concept 1 Alternative 2

As in Concept 1 Alternative 1, this proposed design has several advantages and disadvantages (Table 3). Primary advantages of this design include keeping new infrastructure to a minimum, improving connectivity and keeping vehicles off the most sensitive portions of the beach. Placing parking in areas where visitors already park reduces the impact on sandy spaces and maintains access to popular destinations, including A1A, Helen Cooper Floyd Park and the Little Jetties sandy shoreline.

The limited on-site parking may be a concern for some community members. Although the design keeps the majority of vehicles off the beach, a small portion of the sandy area is being impacted by parking. By positioning cars adjacent to the marsh, stormwater runoff and other potential contaminants may affect marsh health. Despite these potential issues, this alternative improves access and offers a practical approach to managing visitor impact while protecting the shoreline.

Concept 1 Alternative 3

This design offers multiple advantages (Table 3). Of the three alternatives under Concept One, it provides the most on-site parking and shoreline stabilization interventions. It incorporates indigenous vegetation, pervious surfaces, bioswales and other stormwater management solutions to help mitigate the ecological impact of increased parking area. By moving parking away from the bay, it reduces the risk of direct stormwater runoff contaminating the marsh as well.

The disadvantages of this alternative include the area of sandy soils it occupies. To accommodate standard parking stall sizes, a merge lane and pedestrian pathways, this design displaces more of the sandy area at the Little Jetties adjacent to A1A than in the previous two alternatives with an improved parking surface. Despite the cons associated with this alternative, it is the most comprehensive of the three and directly addresses community concerns and grant priorities.

Concept 2 Alternative 1

Concept 2 Alternative 1 provides several benefits and advantages (Table 3). Raising A1A provides a long-term solution to flooding and periodic inundation, ensuring that residents will consistently be able to safely access their homes and resources in Mayport Village. It also repurposes the existing A1A footprint to create a continuous and accessible multi-use pedestrian path that increases connectivity across the site. This alternative additionally removes vehicles from the beach entirely by raised parallel parking, reducing erosion while still allowing for visitor access. Layered natural infrastructure elements such as breakwaters, sand deposition and increased indigenous vegetation rebuild natural buffers. Together, these methods enhance the shoreline's stability along with visitor programming aimed at keeping foot traffic in vulnerable areas to a minimum.

Likewise, there are potential challenges with this alternative. Parking along the elevated A1A may feel less accessible due to its immediate proximity to traffic moving at speeds of 35-40 mph, with no dedicated acceleration or deceleration lanes. Although parking is placed in straightway stretches along the alignment for this reason, this could create safety concerns. Community feedback may also reflect dissatisfaction with the removal of parking from the sandy beach area because it would require visitors to park on the elevated causeway and transport their belongings down ramps and along pedestrian paths. This design is more costly than the previously proposed alternatives due to the elevation and realignment of A1A. This may prove to be less favorable among stakeholders and project partners due to increased costs, permitting and potential project timeline delays.

For this design to be realized, the existing airfield check-in points would need to be relocated. The entrances are currently accessible by the existing A1A, but without access ramps, there would be no way for visitors to access these critical points. The design proposes relocating parking near the Coast Guard station, which would be immediately adjacent to the airfield and accessible by at-grade entrances. Land ownership and usage uncertainties may complicate this proposed move.

Concept 2 Alternative 2

This design presents several benefits (Table 3). Raising A1A ensures long-term continuous and protected access to Mayport Village despite potential storm surges or tidal flooding. By placing parking on the existing A1A footprint beyond the airfield access points, this alternative avoids disrupting airfield operations and minimizes the expense of relocating entrances and access points. The integration of parking and pathways improves pedestrian and cyclist accessibility, allowing visitors to easily reach their destinations from either direction along the existing A1A. Relocating parking closer to the beach and moving the majority of programming away from the most vulnerable shoreline near the Coast Guard station, this alternative creates space for marsh platform restoration and reestablishment.

Despite the pros, this alternative has potential cons as well. Raising A1A and constructing a new alignment requires significant costs, which could negatively impact stakeholder and project partner support. Another drawback might be the limited vehicular access along the existing A1A. The parking layout and service road separation could create potential conflicts between drivers and pedestrians if not carefully programmed for safety, as visitors are used to driving on the entirety of the existing A1A footprint and this alternative limits vehicular traffic midway along the route. Concerning cycling safety, the multi-use bike path narrows significantly from its full 24-foot width in order to accommodate parking on the A1A footprint while maintaining connectivity. This could create unsafe conditions for cyclists as the trail transitions between different widths. Lastly, although the new parking location is closer to Little Jetties Beach than in the previous, it may still be perceived as too far from the shoreline, leading to potential community pushback.

Concept 2 Alternative 3

This alternative offers several valuable advantages (Table 3). By removing parking from both the existing and raised A1A alignments, it offers maximum safety and improves vehicular and pedestrian traffic flow. Redirecting vehicles away from the vulnerable shoreline area near the Coast Guard station reduces infrastructure stress and provides additional opportunities for marsh restoration. Another pro of this design is that parking is relocated closer to popular site destinations such as Helen Cooper Floyd Park and the sandy beach at the Little Jetties. The elevated and realigned A1A option takes inundation risks into consideration and guarantees long-term safe access to Mayport Village for commuters and residents. Lastly, in responding to concerns, this design introduces the option to restrict vehicular access after-hours by controlling access to the lower A1A parking area.

Cons to consider with this alternative are the cost and environmental disruption associated with raising A1A and constructing the new causeway. Such factors may affect stakeholder acceptance and disrupt the project timeline and overall feasibility. Relocating parking to the beach presents concerns about potential impacts on shoreline stability, as mentioned in Concept 1 Alternative 3, despite the additional erosion control measures to mitigate the effects of the proposed parking. Compared to the other alternatives, this option designates the least amount of the existing A1A footprint to pedestrian and cyclist use. A larger portion is allocated to vehicular circulation and parking access compared to the previous two alternatives within Concept 2.

Table 3: Alternatives Advantages and Disadvantages

Design Number	*Concept*	*Design Description*	*Advantages*	*Disadvantages*
1	**Concept 1 Alternative 1**	At grade, parking near jetty	• 2nd most minimal intervention • Keeps vehicles off the beach • Provides some parking on site and some in town w/ access • Takes up minimal sandy space • Central location for AIA, HCF and 'Little Jetties' access	• Does not offer much onsite parking • Minimizes beach area • Facilitates vehicular presence on coastal sand areas • Potential of runoff into marsh
2	**Concept 1 Alternative 2**	At grade, parking along curve	• 3rd most minimal intervention • Provided more parking • Incorporated eco. elements (breaks up parking, pervious surfaces, bioswale areas) • Moves parking away from the bay	• Facilitates vehicular presence on coastal sand areas • Increases compaction
3	**Concept 1 Alternative 3**	At grade, parallel parking	• Minimal intervention • Parking connects to multi-use path and destination areas • Keeps parking out of curve • Keeps cars off the beach	• Does not create dynamic programming • Parking is removed from most desired space and may create neg. feedback
4	**Concept 2 Alternative 1**	Causeway, parallel parking	• All existing A1A for pedestrians and cyclists • New elevation is mindful of inundation risks • Provides extended lifeline of A1A and guaranteed access to Mayport Village for residents • Parking in non-curve areas is safer for drivers • Incorporated natural infrastructure interventions	• Visitors are further removed from favorite destinations • Parking makes transport of recreation items difficult • Larger cost and initial disruption to Little Jetties and surrounding habitats • Need to relocate Airfield Access points
5	**Concept 2 Alternative 2**	Causeway, hammerhead parking	• Raises AIA for protected access into Mayport (SLR) • Does not interfere with Airfield access points • Integrated parking w/ paths • Bikers and pedestrians can use existing A1A to access destination points • Significant marsh creation	• Potential costs • Vehicular access dead ends • Potentially unsafe service road access to HCF • Bike alignment may not be safest for bikers • Parking may still be too far away from "Little Jetties"
6	**Concept 2 Alternative 3**	Causeway, parking along old A1A curve	• Removes parking from existing and raised A1A • Utilizes existing A1A footprint for HCF service road and parking access. • Utilizes existing A1A for multi-use path • Takes pressure off grant location by relocating vehicle traffic, minimizing access and moving programming • Visitors closest to beach access with safe Mayport Village access • Maximum marsh creation	• Larger cost and initial disruption • Parking on the beach will require erosion mitigation efforts • May need after-hours access limitations for visitors based on surveys • Less of A1A is dedicated to pedestrians and cyclists

Preferred Alternative

The recommended design alternative for future development is Concept 2 Alternative 3 (Table 1). This design aligns with grant goals by incorporating NbS, such as oyster reef breakwaters, salt marsh restoration and creation, beneficial use of dredged sediment and hybrid living shorelines. It also effectively responds to community feedback by highlighting the natural beauty of the area, using indigenous trees and other plantings to create a biodiverse habitat for wildlife, manage erosion and promoting conditions that allow salt marshes to reclaim sections of the shoreline. The design limits parking areas to minimize ecological impact and future erosion while considering the community's preference for maintaining shoreline visibility. Additionally, the design responds to the community's interest by providing habitat for marine life and enhancing fishing opportunities through marsh creation, increased vegetation for erosion control and marine habitat and accessible pedestrian paths to designated fishing spots.

Specific design interventions that address community input and various challenges include the elevated and newly aligned A1A, which offers safe access into Mayport Village and an accessible, continuous path for pedestrians and cyclists on the existing A1A footprint below. The design focuses on restoring the shoreline and providing long-term stability through NbS reducing the need for recurring future interventions. The alternative proposes breakwater structures with the potential to serve as oyster reef breakwaters and are designed to slow wave energy, allowing vegetation to establish and further contribute to shoreline protection. The creation of living shorelines will help establish marshes, integrating the breakwater structures to buffer storm surge and reduce flooding.

Community responses indicated strong community support for limiting onsite parking if it helps protect the shoreline from further erosion. This design solution achieves that goal while still allowing visitors easy access to Little Jetties Beach. Parking is designated within the existing road shoulder and some of the sandy areas. To mitigate potential negative impacts, features such as permeable pavement, vegetated islands with curb cuts to capture stormwater runoff and the potential for a bioswale to manage additional stormwater are incorporated into the design. The proposed wall separating the different elevations prevents vehicles from driving onto the sandy beach, maintaining access while protecting the shoreline from vehicle-induced erosion.

For long-time visitors who have enjoyed the beauty of the site with family and friends, the new design elevates their experience by providing enhanced access to well-loved and frequently visited scenic spots. The proposed network of paths and amenities contemplates an expansive visitor circulation system alongside A1A and through Helen Cooper Floyd Park and the Little Jetties shoreline, connecting designated fishing spots and providing accessibility from Mayport Village. This continuous path offers visitors a safe and experience-enhancing route, with features like a marsh boardwalk and overlooks at key locations such as the viewshed across Chicopit Bay. These spaces allow visitors to appreciate the surrounding beauty that has drawn them for years and strengthen the community's connection to the site.

Process

This project followed a workflow similar to the typical landscape architecture design process, including gathering resources, mapping, conducting site visits and observation, data collection, refining maps, developing initial hand graphic concepts, researching community engagement strategies, iterating designs and comparing and analyzing the final alternatives (McHarg, 1969; Simonds, 1998).

Throughout the process, it became increasingly clear how much technical knowledge concerning NbS is necessary for understanding proper placement and appropriate implementation (Dolatowski et al., 2024). As I studied breakwaters, living shorelines, marsh enhancement, beach nourishment and other coastal interventions, I encountered concepts that required deeper exploration and specialized training to grasp fully. If these designs are introduced to the public, an educational component will be essential to explain each intervention's purpose, function, placement and benefits. By combining the different shoreline stabilization technologies and ecological interventions throughout the six presented alternatives, stakeholders can better understand how different methods work within the landscape and how they respond to different scenarios.

When designing site-specific and adaptable elements such as natural infrastructure, hand graphics, including quick sketches, diagrams, and hand-drawn perspectives, remain one of the most effective tools for engaging the public and generating meaningful design ideas (Törnroth et al., 2022). While digital tools have become standard in design practice, hand graphics offer unique advantages that make them particularly well-suited for public engagement and co-design processes (Van Dijk, 2005). Hand graphics make complex ideas easier to understand, easily facilitating a shift in scale from broad landscape systems to site-specific details (Carr & Schissler, 1969). This further assists people to visualize how a specific element works and where it fits in their community. This is essential when engaging communities potentially unfamiliar with formal plans or technical design renderings (Van Dijk, 2005).

Unlike polished digital visuals, hand sketches feel approachable (Ashtari & de Lange, 2019). They signal that ideas are still evolving, which invites feedback and encourages collaboration (Daniel, 2012). In public workshops or co-design sessions, participants are more likely to respond to hand drawings because they feel informal and inclusive, not final or unchangeable (Van der Lugt, 2005). This visual connection level brings designers and community members together, creating a space where people feel comfortable offering input and suggestions (Schütze et al., 2003).

Co-design processes occur in real time with people sharing ideas, reacting to concepts, and proposing alternatives in the moment (Kavakli et al., 1998). Hand graphics allow designers to respond simultaneously (Gomes et al., 2016). A quick sketch can clarify a suggestion, test a new layout, or explore a different design possibility without interrupting the ongoing conversation (Daniel, 2012). This flexibility supports design momentum and assists with concept evolvement, often shaped by input from the people most affected by the project (Sanders & Stappers, 2008).

Hand graphics additionally capture the 'feeling' of spaces (Anderson & Helstrup, 1993). A sketch of a shaded gathering space or communal beach access can communicate more than the layout, but the mood of a place as well (López-Chao & Rodríguez-Grela, 2023). This emotional significance helps people connect to ideas and imagine themselves in the envisioned spaces (Herbert, 1988). This connection is key to building community support for long-term investments in green infrastructure. When designers sketch in real-time with an audience, they show their thought processes and their willingness to adapt to suggestions (Ashtari & de Lange, 2019). This transparency has the potential to build trust (Gomes et al., 2016). It emphasizes that the overall project or most distinct design elements are not finite or being imposed on a community but can continually be shaped in dialogue (O'Donnell et al., 2025). This provides a valuable opportunity to engage in a new way in communities where residents have experienced top-down initiatives in the past (Page et al., 2016). Hand graphics are an accessible and effective way to make the co-design process more transparent, participatory, and responsive (Törnroth et al., 2022).

Communicating complex ideas in an accessible manner will be essential for successful and productive community co-design sessions. Throughout the process of this project, hand graphics played a vital role in quickly exploring ideas and refining designs. Their flexibility made it easy to test different approaches and adjust in real-time. If this project moves forward into a co-design phase with the Mayport community, hand graphics should remain central to the process. Unlike digital tools and programs, sketching is immediate, accessible and encourages participation without requiring specialized software or skills. While some may feel hesitant to pick up the pen, co-design allows for an iterative, collaborative approach that makes the process more inclusive and adaptable (Van Dijk, 2005).

Lessons Learned

This project provided valuable insight into the overall design process for an area of this scale. Personal previous design experience had not involved a site this large without collaboration from other project design partners. Planning for an expansive area requires integrating multiple smaller sites into a cohesive whole, which involves accounting for various soils, vegetation, environmental risks, programming needs and other key factors typically associated with a project of this nature.

Throughout the process, it was necessary to become familiar with several topics where personal knowledge and experience varied or was previously limited. These included participatory frameworks, shoreline enhancement methods, community-informed design, road design and airfield clearance zone requirements. The project required input from multiple disciplines, making it multifaceted in scope. Beyond gaining familiarity with these subjects, application of knowledge and techniques presented challenges and required stepping beyond personal comfort zones. Understanding how these elements fit together was not always intuitive and often required trial and error. The iterative nature of initial concept generation and subsequent refinements were instrumental in the design process and in finding solutions effectively responding to project objectives and community input.

Another critical area of study was resilience planning and the public engagement model known as Dutch Dialogues. Initially, finding literature beyond case studies on city websites proved challenging. However, further research led to a deeper understanding of the foundational Dutch Dialogues framework and its implementation in various cities since its initial development. This approach gives the public a voice in early-stage planning, allowing for the integration of water-focused resilience strategies that directly impact their communities. However, the Dutch Dialogues process is a significant undertaking, requiring extensive collaboration among project partners, government officials, stakeholders and subject matter experts. Additionally, executing a months-long collaborative effort with a range of partners demands a substantial allocation of resources, not only for the planning phase but also for implementing well-informed and responsive solutions.

For future project opportunities with the Mayport community, existing design alternatives could be adapted and applied, drawing inspiration from elements of the Dutch Dialogues framework. Planning a co-design project inspired by the Dutch Dialogues process using pre-developed alternatives offers advantages and disadvantages. Having proposed designs can streamline the inventory and mapping process, reducing upfront costs. However, a potential downside is that introducing pre-planned options too early may limit the community's ability to envision alternative solutions once familiar with pre-prepared alternatives. Even though these designs are intended as foundational materials to be edited and built upon, they could unintentionally shape public perception in a way that stifles creativity. To prepare for this, co-design sessions could be conducted before presenting any design alternatives, providing stakeholders and community members with the mental space and freedom to explore possibilities without predefined constraints (Beaty, 2020).

The benefits of using hand graphics as an iterative design tool became evident throughout this process. Quickly sketching and mapping design elements was essential when working through the placement of NbS and initial concepts. Keeping hand graphics loose during the early planning helped prevent designs from feeling too finalized, allowing for greater flexibility and adaptability. This accessibility and flexibility may prove essential in future co-design processes, making it valuable to explore hand graphics further as a collaborative tool in upcoming projects (Verma, 2019). Overall, the process revealed that Mayport is an excellent option to engage in co-design during future project phases. The feedback reveals a group of people passionate about this site and open to changes if it means preserving the shoreline.

Public Engagement

Public engagement is integral to the success of designing and implementing NbS in coastal areas such as Mayport, Florida. By involving the local community, it is more probable the solutions will not only address environmental challenges like sea-level rise and erosion but will garner public support, contributing to the project's long-term sustainability (Cooper et al., 2023). Other benefits of community engagement include opportunities for education, fostering public acceptance and integrating local knowledge, all of which contribute to more resilient and adaptive infrastructure (Jones & Russo, 2024).

Effective public engagement can lead to innovative solutions tailored to the specific needs and preferences of the community (Doğu et al., 2024b). Public acceptance is a critical factor in the success of NbS. As NbS often involve substantial changes to the landscape and environment, gaining community support through early and continuous engagement can ensure smoother project implementation (Jones & Russo, 2024). Research demonstrates when communities are engaged in the design process, there is a higher level of project success and long-term performance (Wells et al., 2023). Projects that prioritize stakeholder input and transparent communication can also enhance community ownership over the solutions implemented in their communities (Zikargae et al., 2022).

One of the key advantages of public engagement is the ability to draw on local knowledge (Lynam et al., 2007). Coastal communities, particularly in areas facing environmental challenges, often have a better understanding of the complexities of their local ecosystem. Their observations on issues such as flooding, stormwater management, sediment transport and changes to their landscape over time can provide crucial insights that inform the NbS design process.

Frameworks Comparison

Understanding the value of public engagement in practice requires examining the tools and frameworks used to structure the participation. While community participation is acknowledged as essential to the success of nature-based solutions, the depth and quality of that engagement can vary significantly depending on how it is facilitated. Frameworks provide a lens through which to evaluate these dynamics to generate meaningful engagement with the community and other stakeholders.

Although first published nearly 50 years ago, Arnstein's framework remains relevant. The language and structure for public engagement as detailed by Arnstein, has served as a common foundational concept for variations that have emerged over the years (Shirk et al., 2012). Even as a key tool in planning conventional participatory processes, Arnstein's Ladder includes effective elements and areas requiring refinement (Cornwall, 2008).

The Ladder's greatest attributes lie in its ability to serve as a guide to increasing levels of public participation and power (Stephen et al., 2024). Arnstein's framework addresses the 'top-down' nature of conventional planning and enables local community members to contribute their voices and knowledge (Doğu et al., 2024a). By providing eight different rungs with varying levels of participant power, this framework provides a range to best fit the appropriate level of involvement needed for each project (Macgregor, 2008). Since the publication of Arnstein's article over 50 years ago, the framework has served as a standard for policy making, highlighting the powers struggle between government officials and community activists (Tritter & McCallum, 2006).

The Ladder of Participation has long been a widely accepted and referenced model for public engagement. However, critiques have emerged since its publication, pointing out areas for improvement and inspiring the development of new frameworks for public engagement. The first critique is that Arnstein's framework overlooks the diversity of knowledge and expertise among users, providers and policymakers (Tritter & McCallum, 2006). The model presented by

Arnstein remains relevant to a more general audience. Arnstein states, “The underlying issues are essentially the same-’nobodies’ in several arenas are trying to become ‘somebodies’ (Arnstein, 1969). She goes on to mention that the ‘somebodies’ in question broadly want to assume the power to make institutions responsive to their views (Arnstein, 1969). Although the generalized framework makes it possible to adapt to the unique engagement, it does not account for the particular strengths and power dynamic brought by specialists (Kotus & Sowada, 2017).

Additionally, it fails to recognize that participating in the process can be a meaningful goal for some users (Tritter & McCallum, 2006). When proposing participatory practices, it is imperative to remember some frameworks are idealized views of engagement and may ignore the practicalities that come with community engagement (Stephen et al., 2024). Oftentimes public engagement spaces are dominated by those who have excess time to pursue their personal interests (Lowndes et al., 2001). The process of engaging participants is not always straightforward. Many choose not to engage, believing their input will be ignored or used to suit the leadership’s predetermined goals (McGuirk, 1995). This deficit in institutional trust presents a barrier to comprehensive community representation.

Another potential issue with Arnstein’s framework is not accounting for many disadvantaged groups that are not included in such engagement (Kotus & Sowada, 2017). The ‘hard-to-reach’ groups are often so for multiple reasons (Lowndes et al., 2001). Lacking time, awareness concerning participation norms, or confidence to become involved are reasons groups become difficult to engage (Brackertz et al., 2005). Other limiting disconnects include difficulty understanding how development in question will impact them or preferring such decisions be left to those already in power (Parker et al., 2023).

Criticisms surrounding the Ladder of Participation seek a deeper assessment of who is enabled or excluded during public engagement (Table 4). Criticism that the model is limited by a narrow conceptual aspect of activism and fails to account for varying levels of desired participation has driven the development of more dynamic frameworks (Tritter & McCallum, 2006). Whereas Arnstein's Ladder works with the dichotomy of inclusion versus exclusion, other models such as Jules Pretty's and Sarah White's typologies attempt to capture participants seeking other venues of involvement, methods that focus continuous involvement rather than a one-off approach and using broader terms apart from 'citizen' and its associated restrictive legal implications (Tritter & McCallum, 2006).

Pretty's typology offers several strengths (Table 4). It clarifies the distinction between surface-level involvement and meaningful engagement, making it applicable across various contexts. It highlights the importance of power-sharing and emphasizes community empowerment and sustainability (Pimbert & Pretty, 2013). However, this framework has challenges. In practice, the levels of participation often overlap and projects may incorporate multiple forms of engagement. Achieving higher levels, such as Interactive Participation or Self-Mobilization, demands substantial resources, time and institutional support. Without targeted efforts, marginalized groups may still be excluded, even in projects that aim to be participatory (Pretty & Pimbert, 1995).

When compared to Arnstein's Ladder of Participation, Pretty's typology shares common ground, particularly in its focus on power dynamics and the continuum from tokenism to meaningful engagement (Puskás et al., 2021). The lower tiers of Pretty's framework, such as Manipulative Participation, align with Arnstein's "Nonparticipation," while higher tiers, like Interactive Participation and Self-Mobilization, parallel Arnstein's "Citizen Power" (Puskás et al., 2021). However, Pretty’s model is more attuned to the specifics of development work, accounting for material incentives and the practicalities of project implementation, whereas Arnstein’s ladder is rooted in broader civic engagement (Cote & Nightingale, 2012).

Pretty's emphasis on higher levels of participation offers a practical framework for maximizing community input (Chevalier, 2019). To enable self-mobilization, communities can be equipped with leadership training and access to resources while retaining decision-making authority (Lynam et al., 2007). Interactive participation can be built through collaborative workshops, where stakeholders jointly analyze challenges and develop solutions (J. Pretty, 1995). Ensuring inclusivity is vital, with deliberate efforts to involve marginalized groups and address barriers such as timing, language, or cultural constraints. Transparency and accountability can be reinforced through participatory tools like public meetings or shared budgeting (Bass et al., 1995). Long-term sustainability can be achieved by establishing local institutions capable of adapting to future challenges without external dependency (Lynam et al., 2007). Whereas Arnstein’s Ladder focuses on power and control, Pretty’s attempts to make clear the motivation of those involved (Cornwall, 2008).

One of the key strengths of Sarah White's typology of participation is the ability to clearly differentiate between various forms of engagement (Cornwall, 2008). This distinction provides an understanding of how participation functions in different contexts, making it easier to assess the depth and effectiveness of community involvement. Additionally, White’s typology considers perspectives from those initiating participation (top-down) and the participants themselves (bottom-up), providing a clear view of participatory processes (Network, 2020). A central characteristic of the framework is its focus on transformative participation. which emphasizes greater levels of empowerment and systematic change that create long-lasting impacts (Cornwall, 2008).

However, White's typology has some limitations (Table 4). In practice, the distinctions between forms of participation can become blurred, as real-world scenarios often involve less clear and overlapping approaches. This can make it difficult to categorize participation neatly within the framework (Tisdall, 2013). Furthermore, there is the risk of participation becoming tokenistic, where efforts appear inclusive but fail to deliver genuine engagement or empowerment. Without intentional strategies to include marginalized or disadvantaged groups, participatory processes may unintentionally perpetuate the problem, diminishing the transformative potential and excluding the voices they are trying to capture (Cornwall, 2008).

Lastly, while this typology provides a useful lens for analyzing participation, it offers limited guidance on how to transition from lower forms of participation, such as nominal or instrumental, to more empowering and transformative forms. This lack of implementation strategies and methods can make it challenging to put the framework into practice. However, if the project planning team pairs appropriate methods with this framework, there is the potential for long term empowerment among communities and individuals.

The IAP2 Spectrum offers several advantages as a framework for guiding public participation, including being practical, widely used and offering concrete tools and ethical guidelines (Table 4). It provides a flexible, non-hierarchical approach (IAP2, 2024). The spectrum is intended to help organizations determine appropriate levels of public involvement and provides a clear structure and simple language for professionals and community members to easily understand (Osborne, 2022). In addition to its accessibility, the framework offers flexibility. Users can adapt the framework to serve different project types and community needs, providing a key advantage (Antwi et al., 2025). By encouraging organizations to think carefully about their level of commitment to public involvement, the approach has provided a level of accountability. Its widespread use has also helped establish common language and expectations, making collaboration between groups more cohesive (Lawrence et al., 2018). These qualities have made a consistent and practical resource for involving the public in decision-making and co-creation projects.

The IAP2 Spectrum has some disadvantages. It does not critique power imbalances as directly as other frameworks such as Arnstein's Ladder. Additionally, terms like "consultation" and "empowerment," are often misunderstood, which can cause confusion and inconsistent use (Lawrence et al., 2018). The framework's focus on decision-making tends to shift the importance away from ongoing, long-term engagement (Dawodu et al., 2021). It also leans heavily on top-down processes, giving less attention to efforts where community members take the lead, such as grassroots activism (Zikargae et al., 2022). Since the Spectrum was originally designed with government-led projects in mind, some argue that it doesn't work as well in situations where decision-making power is more evenly shared. Critics have also pointed out that the Spectrum's focus on individual projects can overlook broader goals, like building stronger community relationships or promoting participatory democracy (Dawodu et al., 2021). Additionally, because the framework is simple, there is a risk some users may apply it without fully understanding its purpose, leading to poorly designed engagement efforts (Antwi et al., 2025).

Dutch Dialogues strengths lie in its integrated, multi-disciplinary approach, that combines urban planning, hydrology, architecture and community engagement to create comprehensive water management solutions (Government, 2020). The framework prioritizes long-term resilience and sustainability, focusing on adaptive strategies rather than short-term solutions (Bloemen et al., 2019). Its engagement framework engages stakeholders at all levels, designed for collaboration among government agencies, local communities and technical experts (Table 4). The approach is highly adaptable and has advantages in ensuring that solutions are community informed and are responding to site-specific environmental conditions community preferences (Cote & Nightingale, 2012). This framework promotes a cultural shift toward living with water rather than attempting to control it, making it a strong candidate for projects aiming to encourage sustainable water management practices (Klein et al., 2003).

Despite its advantages, Dutch Dialogues has a limited scope of application, as it is primarily designed for water management and flood resilience. This may prove to be a disadvantage depending on potential application, making it less suitable for broader, non-water focused public participation projects. An additional disadvantage is its implementation requires specialized knowledge in hydrology, urban design and engineering, which may not be readily available in all communities. The framework's multi-disciplinary nature requires substantial coordination among experts, agencies and the public, which can slow down project timelines and make implementation challenging. As large-scale project implementation is often dependent on governmental and project partner support, often requiring external funding, this framework's reach and impact may be limited since both are not always available (de Bruijn et al., 2015).

Each typology provides a framework for practitioners to consider when developing a program for public participation. Additionally, each has strengths and weaknesses making one framework potentially better to utilize over others. Arnstein's Ladder views empowerment as the ultimate goal, critiquing lower levels of participation as inadequate or disingenuous, whereas

IAP2 offers a non-hierarchical, spectrum-based perspective, arguing that all levels, including ‘Inform’, can be valid depending on context and purpose of each project (Contreras, 2019).

IAP2 aligns with Sarah White’s typology in recognizing varying intentions of participation, with ‘Inform’ and ‘Consult’ resembling White’s Nominal or Instrumental participation levels and ‘Collaborate’ and ‘Empower’ aligning with her Representative or Transformative levels of participation (Barry & Legacy, 2023; S. White, 1996). Unlike White’s focus on power dynamics and benefits, IAP2 emphasizes process and stakeholder promises at every stage, providing tools to increase the likelihood of effective engagement (Krishnaswamy, 2014).

Similarly, Jules Pretty’s Interactive Participation parallels IAP2’s ‘Collaborate,’ while his typology Self-Mobilization mirrors IAP2’s ‘Empower.’ IAP2’s practical framework is widely adopted for its clarity and applicability, while Pretty’s typology serves as a theoretical critique of power imbalances in participatory processes (J. Pretty, 1995). Each typology contains nuances that highlight one aspect of public participation or another and all seek to empower the stakeholders (Table 4).

To ensure true public engagement for the co-design process, it is essential to avoid categories limiting genuine involvement while prioritizing those empowering communities. Categories to avoid include Nonparticipation levels such as Manipulation and Therapy in Arnstein’s Ladder, which provide only an illusion of involvement. Passive and Manipulative Participation levels in Pretty’s framework should be avoided, as they keep decision-making power centralized. White’s Nominal Participation, where inclusion is superficial and the lower

IAP2 levels (Inform and Consult), which do not facilitate genuine dialogue, risk diminishing public engagement and should be avoided.

Instead, when drawing inspiration for co-design opportunities, the focus should be on categories that facilitate genuine, active and meaningful engagement. Higher levels of Arnstein's Ladder, such as Partnership, Delegated Power and Citizen Control, ensure communities have a real stake in decisions. Pretty's Interactive Participation and Self-Mobilization levels help drive sustainable, community-led decision-making. White's Representative and Transformative Participation types ensure community voices are heard and influence long-term outcomes. IAP2's Collaborate and Empower stages emphasize co-creation and shared responsibility, making decisions more inclusive and reflective of community needs. The Dutch Dialogues approach strengthens participation by integrating data-driven, community-informed decision-making at project stages throughout, ensuring public engagement leads to representative and responsive resilience planning.

After assessing the characteristics, advantages and disadvantages of the provided frameworks, the Dutch Dialogues method proves to be most relevant to the Mayport, Florida project and future co-design opportunities. Similar to the strengths of the other framework, Dutch Dialogues encourages true co-design by incorporating community members from all background and levels of invested interest to design with other stakeholders, project partners and specialists. As this thesis explores alternatives responding to the environmental conditions and community feedback from the Mayport community, it is essential to assess the relevance of Dutch Dialogue case study the methods, processes, priorities, recommendations and outcomes to best inform future co-design creation with the community of Mayport.

Table 4: Frameworks Comparison

Typology	Key Concept	Levels of Participation	Strengths	Weaknesses
Arnstein's Ladder of Citizen Participation (1969)	Focuses on power distribution in decision-making.	**Nonparticipation** (Manipulation, Therapy), **Tokenism** (Informing, Consultation, Placation), **Citizen Power** (Partnership, Delegated Power, Citizen Control)	Highlights power dynamics, serves as a foundational framework for participation models.	Oversimplifies participation, assumes all projects should aim for maximum citizen power.
Pretty's Typology of Participation (1995)	Emphasizes stakeholder motivation and depth of involvement.	**Manipulative, Passive, Consultation, Material Incentives, Functional, Interactive, Self-Mobilization**	Recognizes varying levels of participation, focuses on empowerment and sustainability.	Overlapping participation levels in practice, high engagement levels require significant resources.
White's Four Types of Participation (1996)	Explores participation's political and social functions.	**Nominal (symbolic), Instrumental (efficiency-focused), Representative (stakeholder voice), Transformative (empowerment & systemic change)**	Highlights hidden power structures, considers perspectives of both implementers and participants.	Distinctions between participation types can be blurred, lacks guidance on transitioning from lower to higher levels.
IAP2 Spectrum of Public Participation (1990s - present)	Focuses on process and engagement promises rather than hierarchy.	**Inform, Consult, Involve, Collaborate, Empower**	Practical and widely adopted, provides clear engagement tools and accountability structures.	Inform and Consult levels may not lead to meaningful influence, can be resource-intensive at higher levels.
Dutch Dialogues (2006 - present)	Integrates public participation with technical expertise for water management and resilience planning.	**Collaborative interdisciplinary workshops, scenario-based planning, multi-level governance**	Tailored to water-based resilience planning, ensures interdisciplinary and community-driven solutions. Hand graphics to generate design concepts through co-design	Limited application beyond water-related projects requires strong institutional support and funding.

Co-Design Materials

As part of a broader collaboration with the Carl Vinson Institute of Government, the University of Georgia, Naval Station Mayport and the Mayport Partnership, future phases of this project intend to include holding town hall meetings and co-design. The intended meetings aim to engage the community in shaping the project through co-design while also providing education on site conditions, grant priorities and ecological considerations such as the benefits of NbS.

To establish a framework for public participation, the literature review examined various engagement models (Table 4). Arnstein's "Ladder of Citizen Participation" provided a foundation for assessing different levels of involvement, while Pretty, White and IAP2's typologies framed engagement as spectrums and levels of progressively more inclusive engagement. The research process revealed The Dutch Dialogues as a relevant approach due to its unique emphasis on water-based co-design, ensuring meaningful public input, especially in projects involving government entities. The six proposed design alternatives serve as a foundation for later discussions and public design sessions, incorporating insights from two rounds of community assessments. Rather than the community starting with a blank slate, these alternatives provide informed base design interventions that address site conditions, ecological interventions and public use programming.

The materials prepared include graphics illustrating site conditions, terrain changes and potential design solutions and will support future co-design sessions. When the community engagement meetings occur, community members will have the opportunity to refine the designs based on their knowledge of the site and its environmental challenges. Some elements of the initial six alternatives may remain, while others may be adapted to better reflect community priorities. By developing initial design options that integrate ecological and infrastructural needs with community feedback, the project prepares future engagement to be productive and grounded in real site conditions. This approach allows the community to visualize potential outcomes, voice concerns and actively respond through future co-design to contribute to shaping Mayport's future.

Future Opportunities

It is recommended that future opportunities for public engagement incorporate the six proposed design alternatives as tools for discussion and exploration. To support meaningful and inclusive participation, a series of public meetings, such as town hall-style events and co-design workshops, should be planned. These meetings would require collaboration with project partners and experts who can share their specialized knowledge in a way that is accessible to the public and aligns with the project's goals.

It is advised that future sessions provide an opportunity to discuss NbS, covering how they work, where they are most effective and the types of scenarios they address. By sharing this information, community members and stakeholders would have the opportunity to better understand the proposed alternatives, equipping them with the knowledge needed to participate actively in the co-design process. This educational component is essential to building community confidence and encouraging stakeholders to fully express their opinions and ideas.

At these meetings, stakeholders and project partners would continue the co-design process from where this project leaves off by collaboratively sketching and conveying different design iterations. This process should combine intervention methods and programming elements through hand graphics for quick, iterative design options. Drawing inspiration from past Dutch dialogues and case studies, it is recommended to adapt the participatory design techniques to the specific context of Mayport and its unique shoreline challenges. While water management challenges are often citywide or watershed-wide, interventions like advanced erosion control and stabilization are typically implemented in stages, starting at the site level and this project highlights this.

As part of potential public engagement and co-design sessions, participants would be encouraged to react to the design alternatives, reinforcing aspects they agree with or offering feedback on what they think needs to be adjusted. They couldT take this feedback further by sketching their ideas on tracing paper, suggesting different combinations of interventions that they believe would work best for their community based on their experiences and knowledge of nature-based infrastructure. Involving the Mayport community in this informed co-design process would ensure that they can actively voice their concerns and iteratively envision design alternatives that meet their needs and preferences.

Following this project, there would be an opportunity to create a report to document this multi-phase design process. The report would include project evolution based on community feedback and unforeseen changes. It would additionally focus on the co-design aspect and discuss the inclusion of community input that led to the alternatives presented to the public. This additional initial work, which is not typically seen in the Dutch dialogues or similar case studies, would help guide the community through the design process more effectively and create another method for similar future projects. This approach would ensure that community members are starting with a foundation and clearly understand the design possibilities. Having the context of a site familiar to them and seeing how the NbS are applied to specific areas would reinforce their knowledge of such interventions and build their confidence to effectively shape their vision of the future.

CONCLUSION

Mayport, Florida, a historic fishing village and home to Naval Station Mayport, faces environmental challenges that require NbS, community-driven solutions. This project explores NbS to enhance the shoreline at "Little Jetties," demonstrating how local engagement and ecological design can strengthen coastal resilience. Integrating historical context, environmental considerations, and community survey feedback, the project provides design materials and community engagement insights for future collaborative efforts that reflect the project's objectives and community preferences.

Mayport's identity as a working waterfront and maritime community reinforces the need to preserve its historic and cultural heritage. Community input revealed that residents consider the shoreline as a valuable asset and favored community gathering space, however, participants noted concerned about erosion and flooding risks. Many favor marsh restoration, groin structures, parking relocation and incorporation of vegetation over seawalls. Shaped by community feedback, the proposed alternatives are flexible, designed to change with future community feedback through co-design efforts that integrate local knowledge with scientific data to inform alternatives and support design decisions.

The preferred alternative was selected through an alternatives analysis that assessed how well each design responded to the presented criteria. The strongest combination of design features and their associated metrics (e.g. area of marsh created, number of proposed parking stalls, number of vegetated parking islands with curb cuts, area of bioretention created, etc.) helped determine the relative strength of each alternative. For future project phases with the

Mayport community, existing design alternatives could be adapted and applied, drawing on elements of the Dutch Dialogues framework. Overall, the process revealed Mayport to be an excellent community to engage in co-design.

This project provided valuable insights into working with community input and addressing environmental risks that leave vital gathering spaces and key infrastructure increasingly vulnerable. The process required extensive research and integrating new technical knowledge across various design alternatives. A deeper understanding of shoreline enhancement NbS and participatory frameworks was gained through the iterative design process. The project revealed that significant effort is required to bridge the gap between community knowledge, genuine co-design, and design alternatives that effectively respond to and represent environmental and programmatic needs. The continual refinement of potential solutions and alternatives reinforced the importance of combining scientific data and community input in guiding meaningful design decisions and shaping valuable community spaces.

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APPENDICES

Appendix A – Inventory Mapping

Appendix B - Community Feedback (Carl Vinson Institute of Government, 2024)

Appendix C – Mayport, Florida Design Alternatives

Appendix D – Dutch Dialogues and Tampa Bay Ready Case Studies

Appendix A – Inventory Mapping

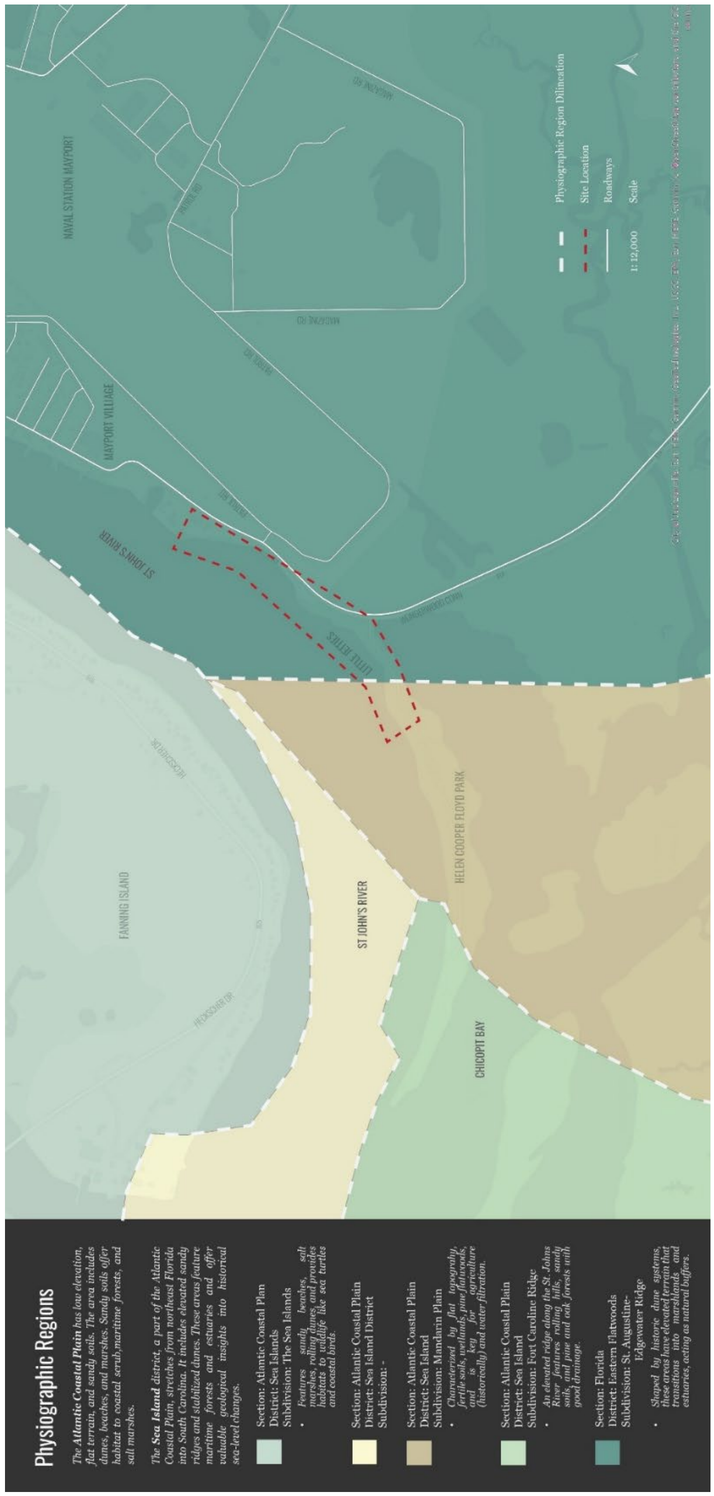


Figure 10: Physiographic Regions Map

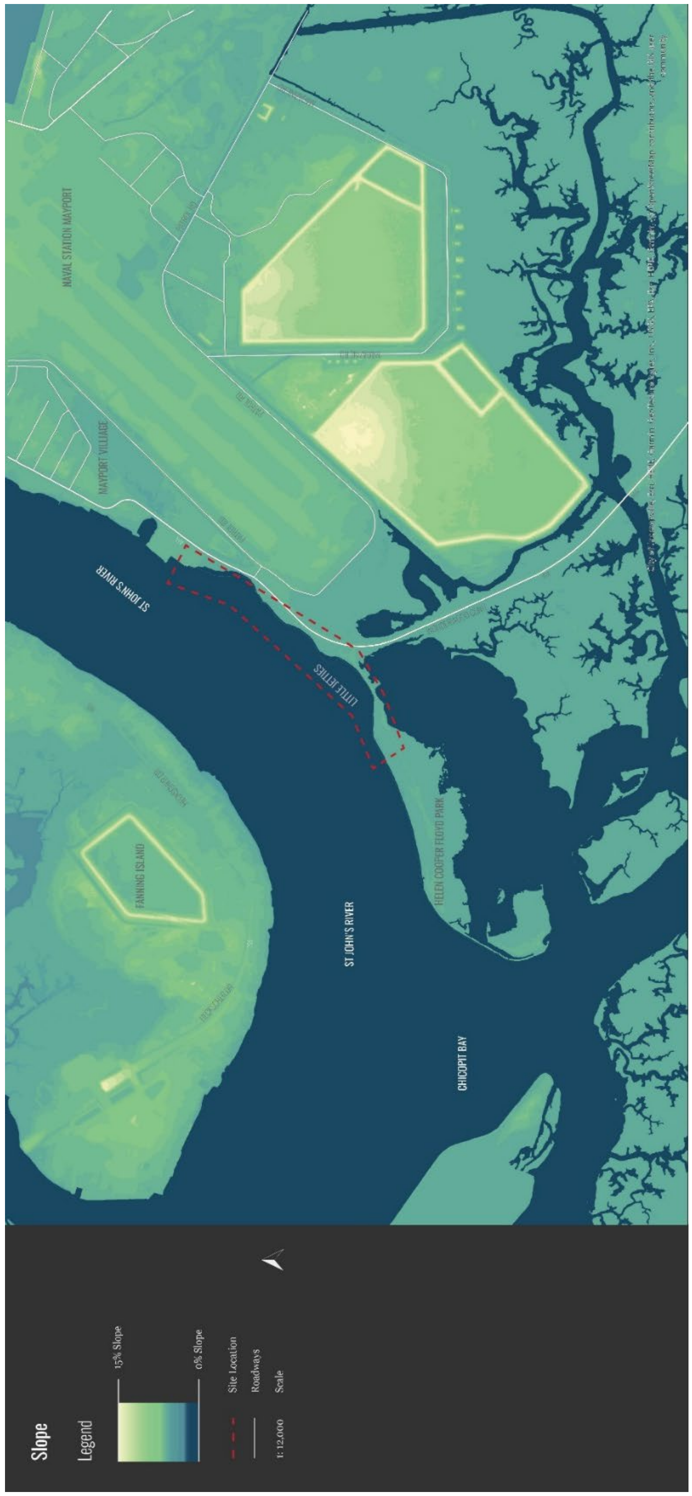


Figure 11: Slope Map

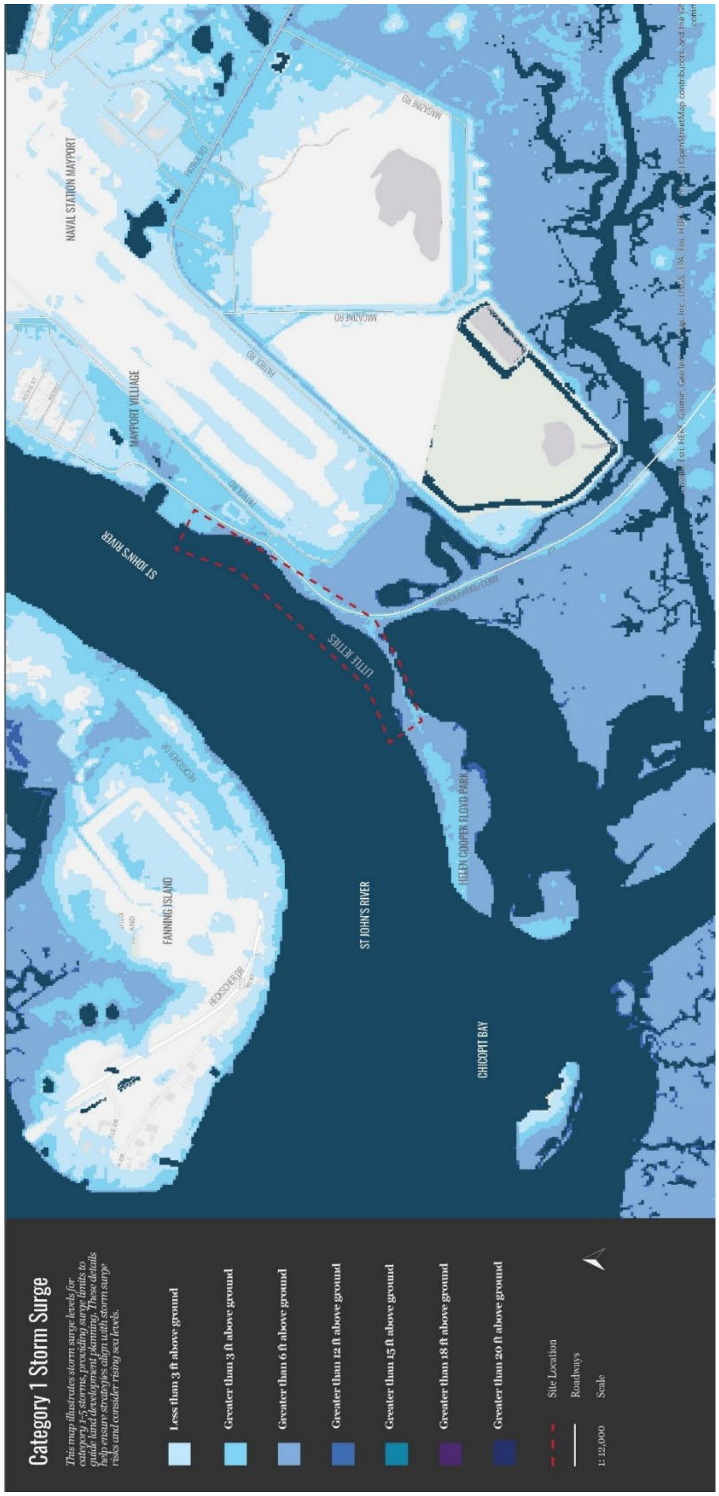


Figure 12: Category 1 Storm Surge Map

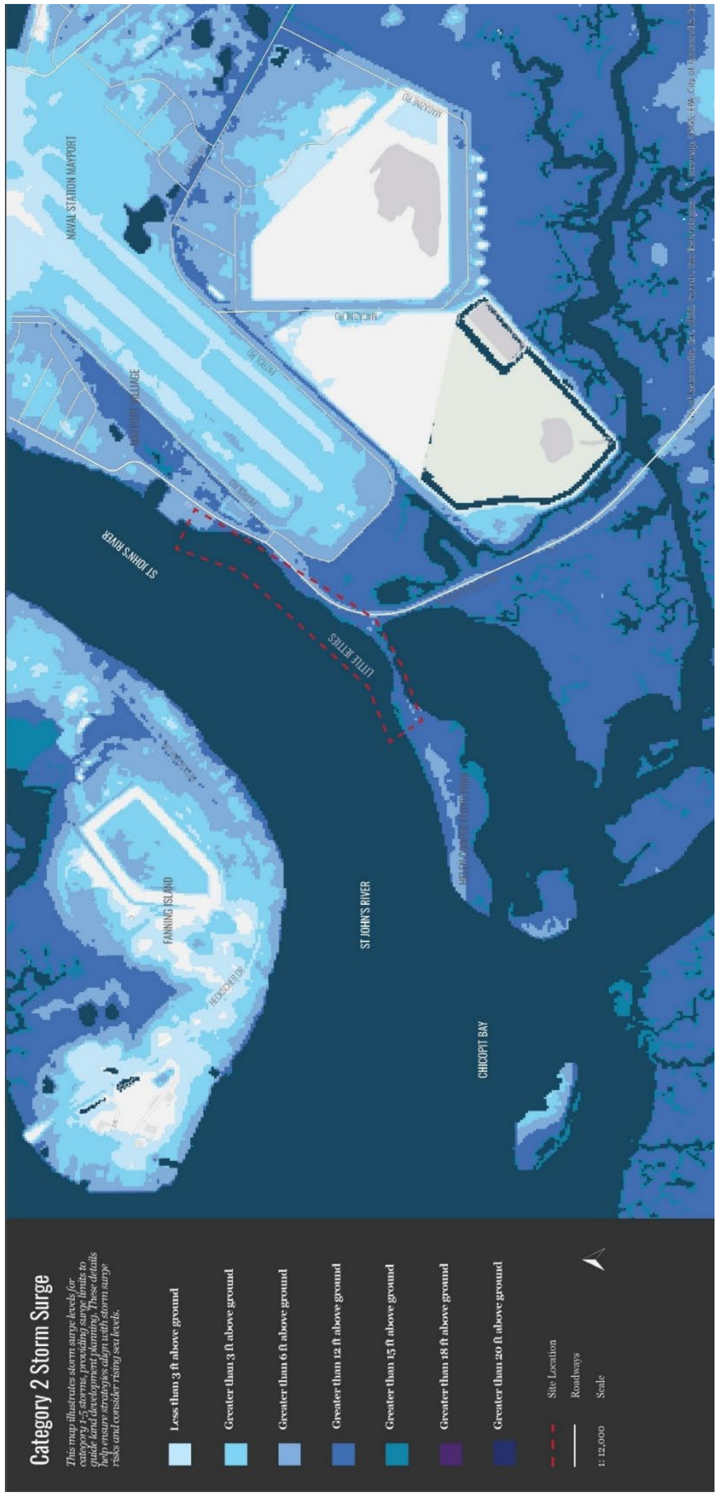


Figure 13: Category 2 Storm Surge Map

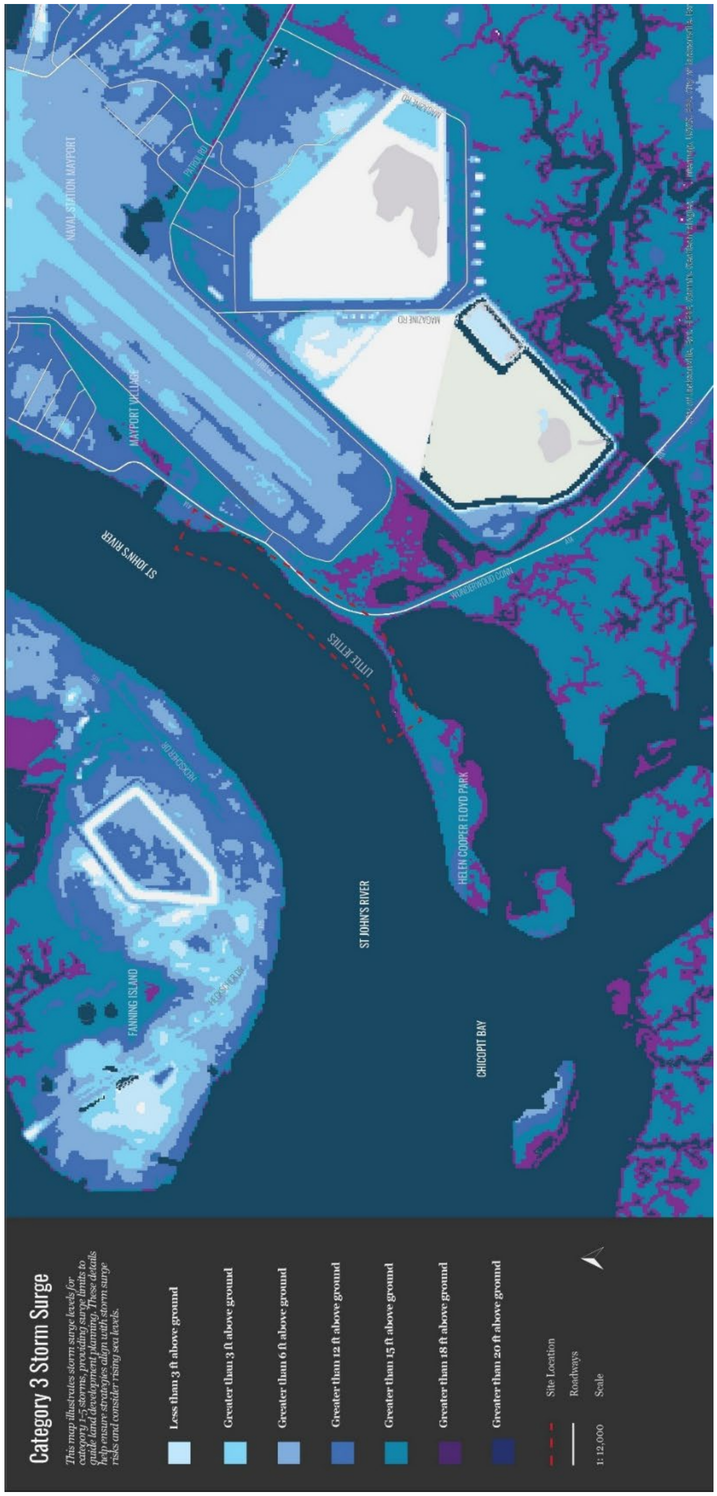


Figure 14: Category 3 Storm Surge Map

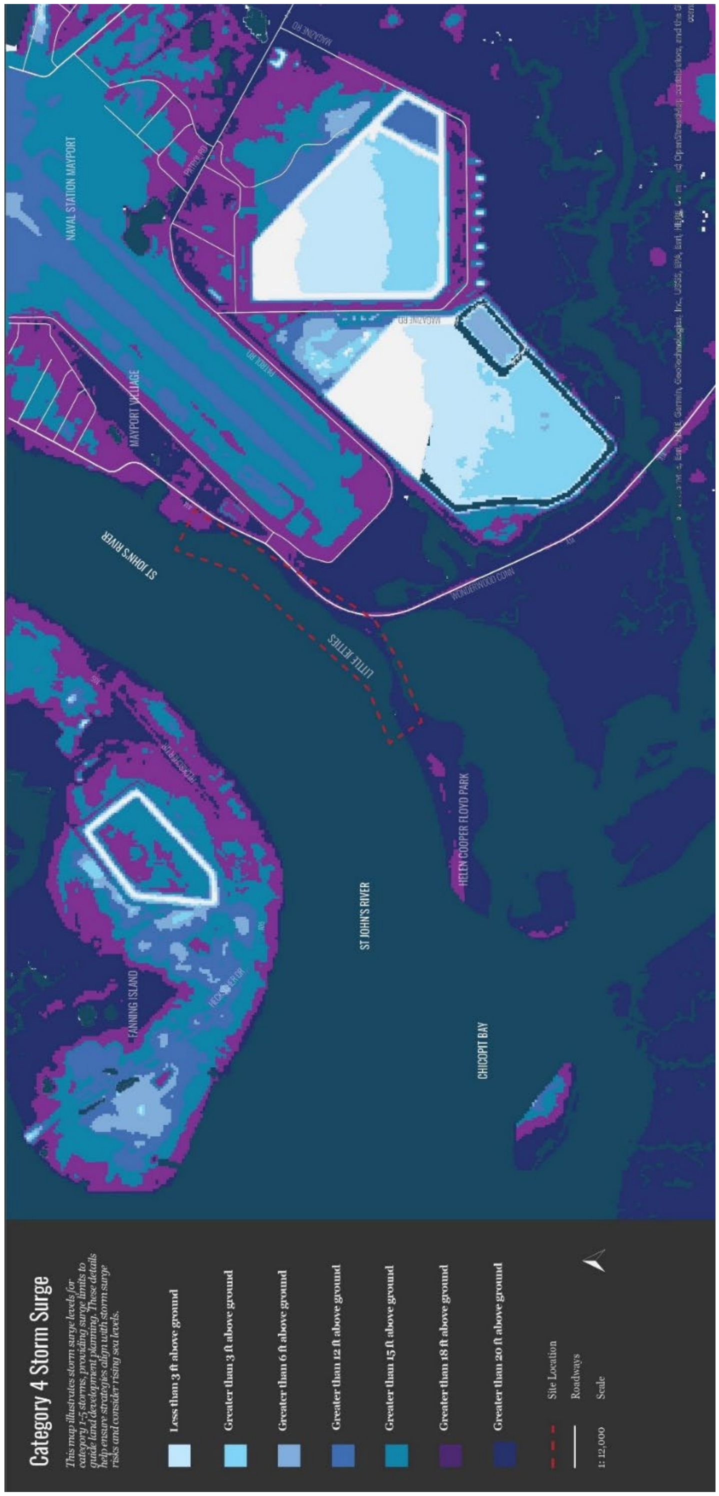


Figure 15: Category 4 Storm Surge Map

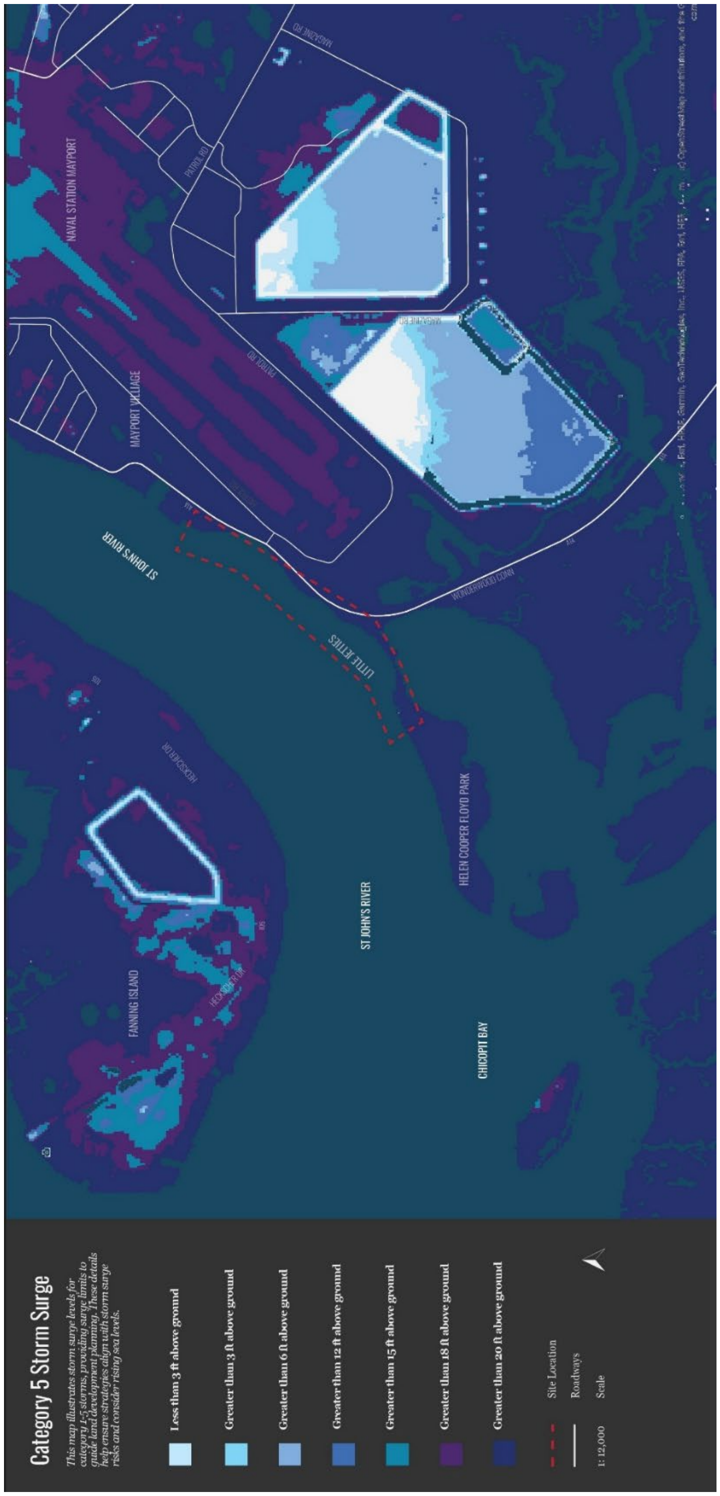


Figure 16: Category 5 Storm Surge Map

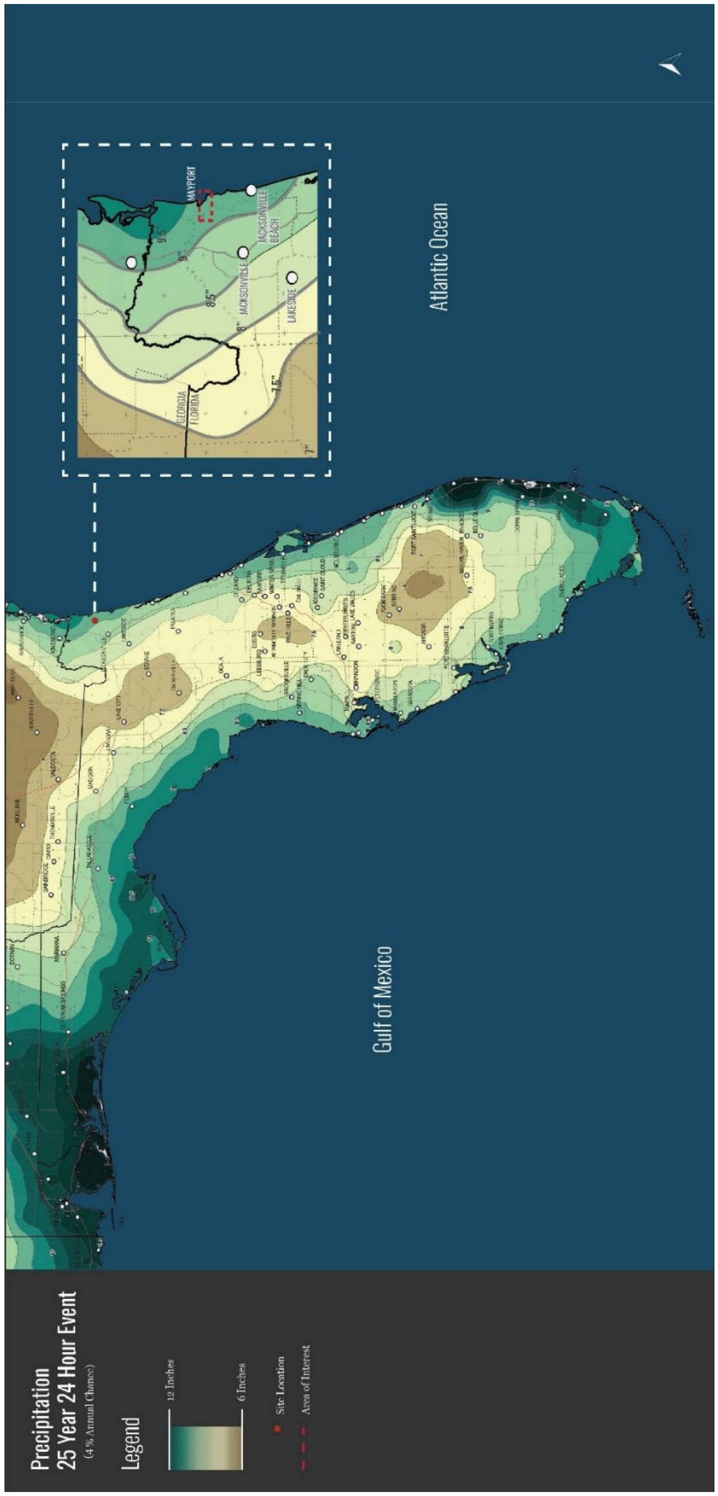


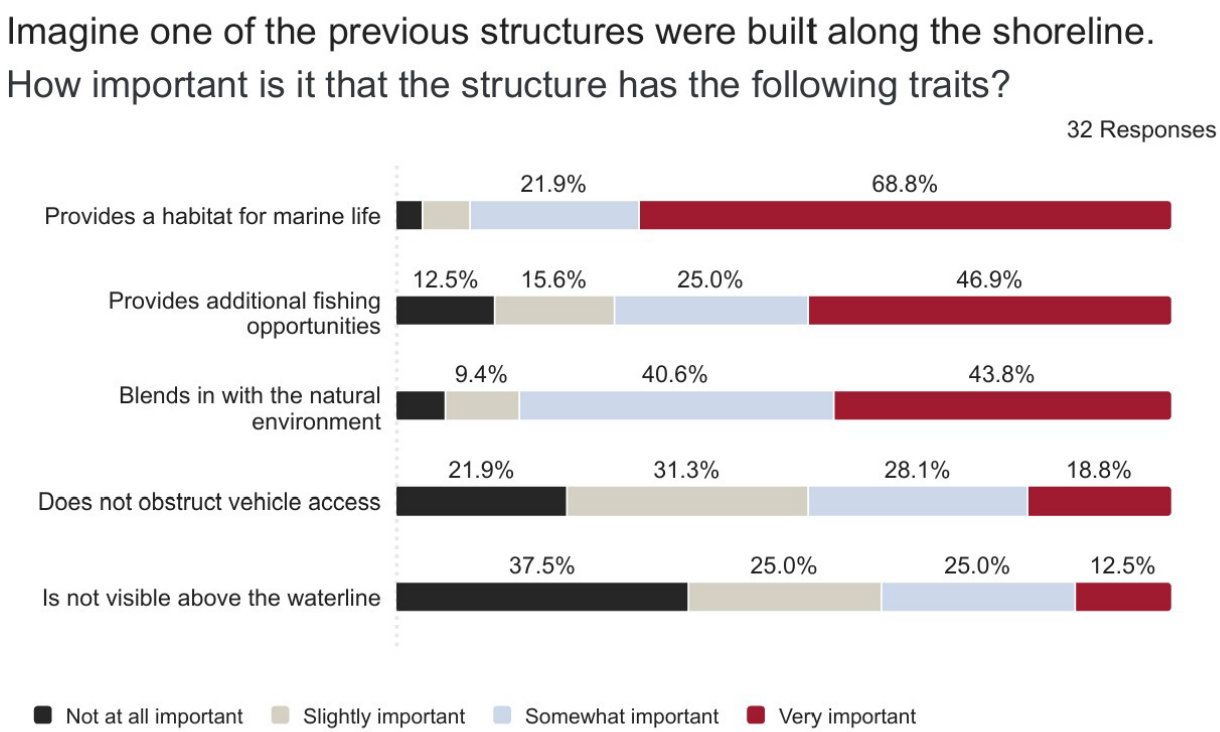
Figure 17: Precipitation 25 Year 24 Hour Event

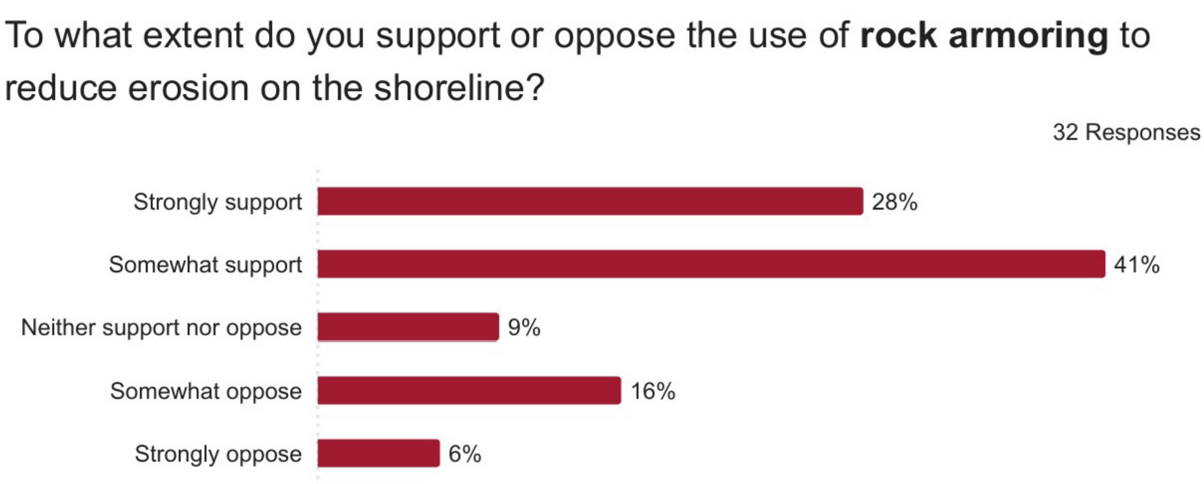
Figure 18: Plant Communities Map

Figure 19: Soil Series Map

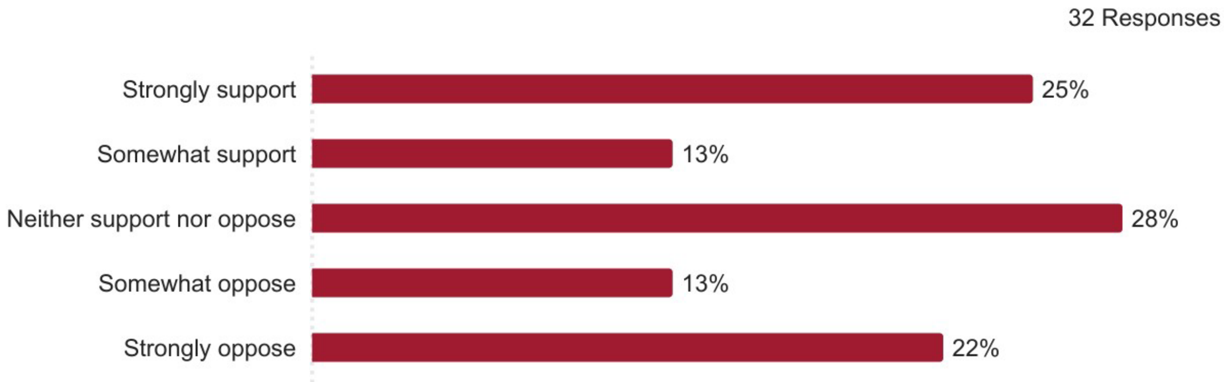
Figure 20: Land Use Map

App. B – Community Feedback (Carl Vinson Institute of Government, 2024)



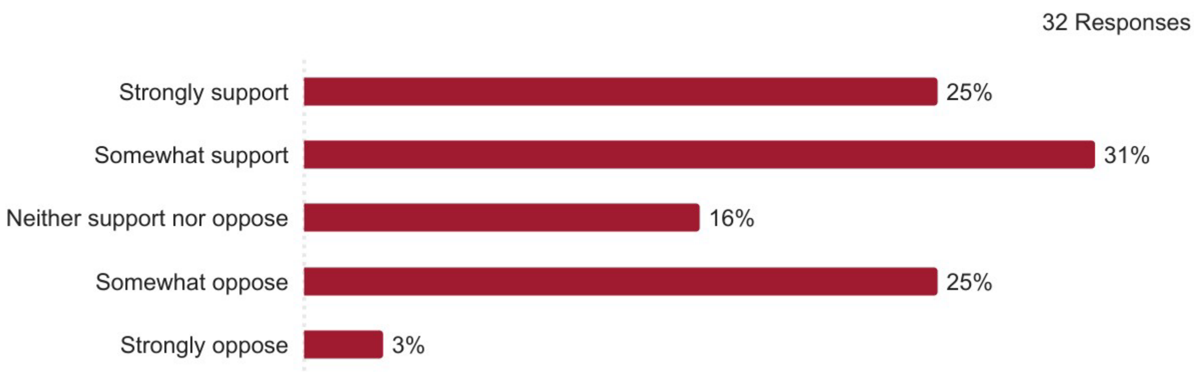


To what extent do you support or oppose the use of **seawalls/retaining walls** to reduce erosion on the shoreline?



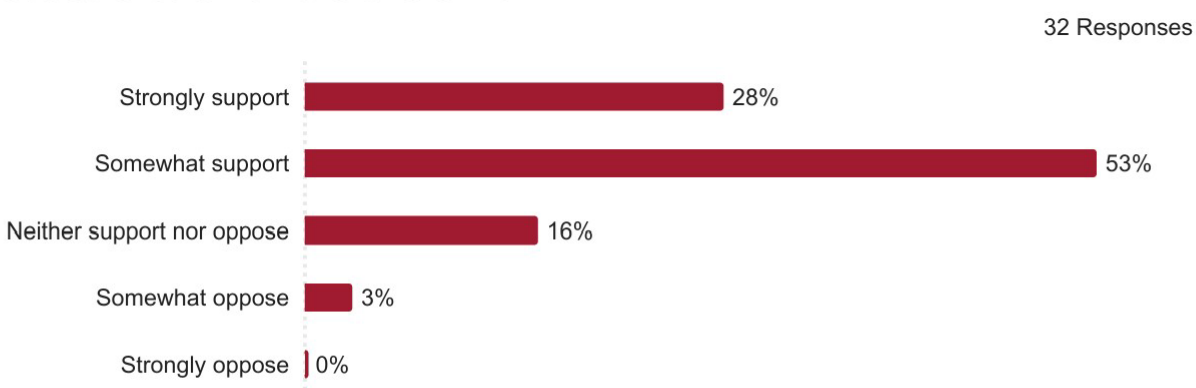
29

To what extent do you support or oppose the use of **breakwater structures** to reduce erosion on the shoreline?



30

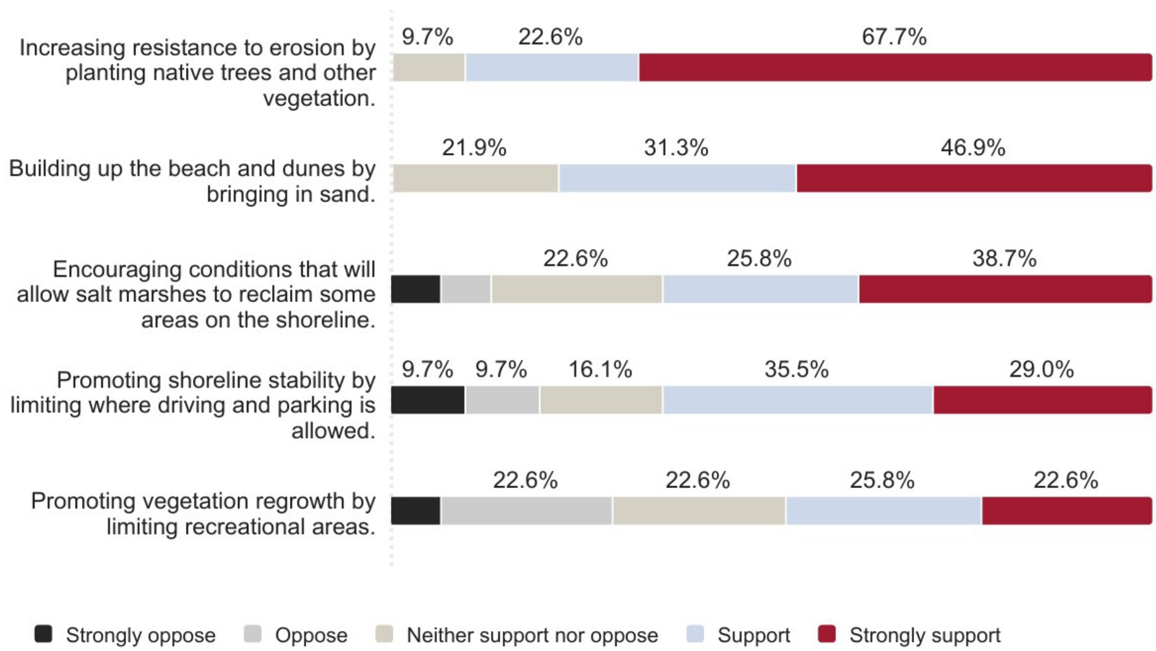
To what extent do you support or oppose the use of **groin structures** to reduce erosion on the shoreline?



31

To what extent would you support or oppose the following methods of prevent...

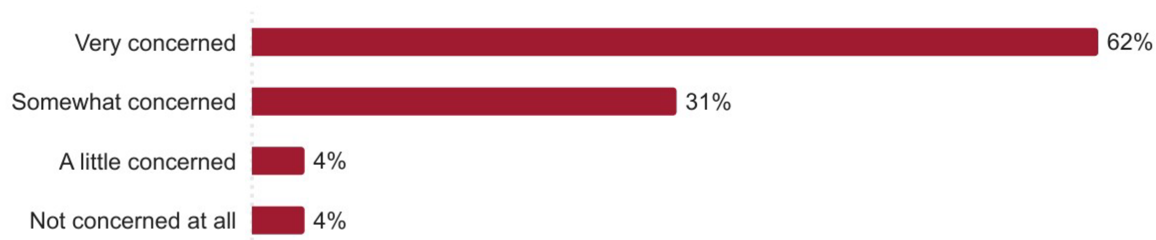
32 Responses



32

As a resident of Mayport Village, how concerned are you about coastal erosion affecting your ability to get to and from your home?

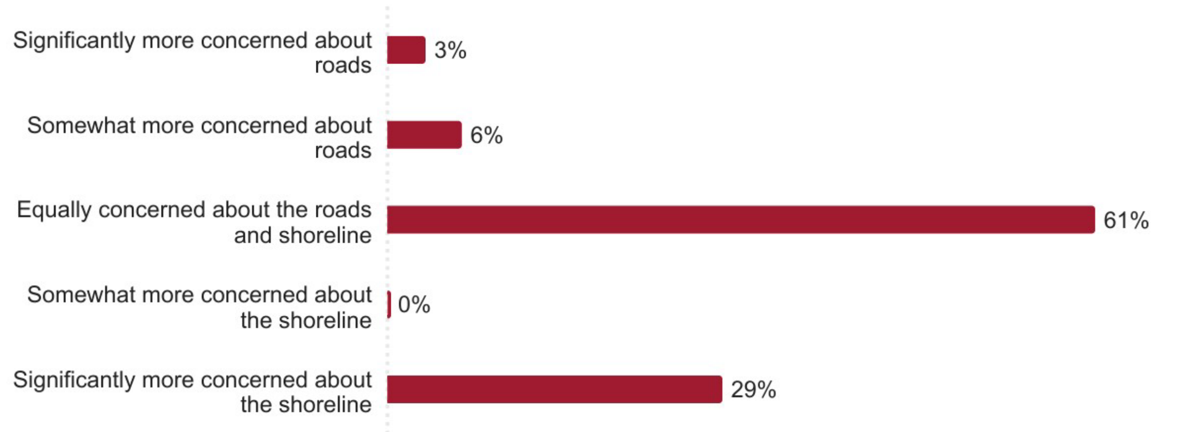
26 Responses



33

Regarding coastal erosion, are you more concerned about potential damage to the roads or damage to the shoreline?

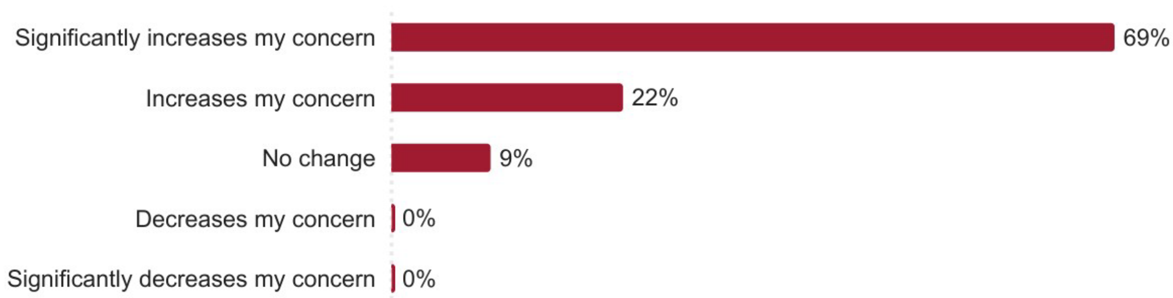
31 Responses



34

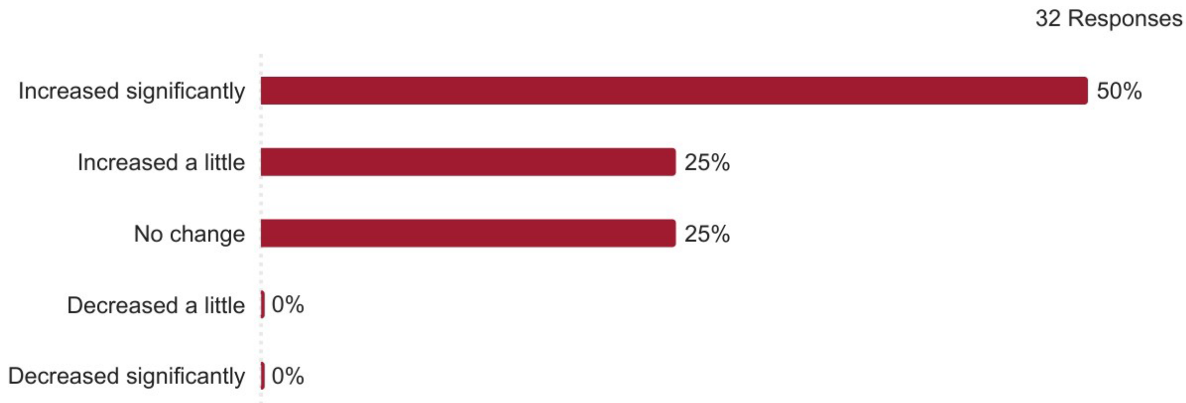
How does seeing these images affect your level of concern regarding coastal erosion along this shoreline? **Question is preceded by two google street view images: 1) The shoreline in 2013; 2) The shoreline in 2024*

32 Responses



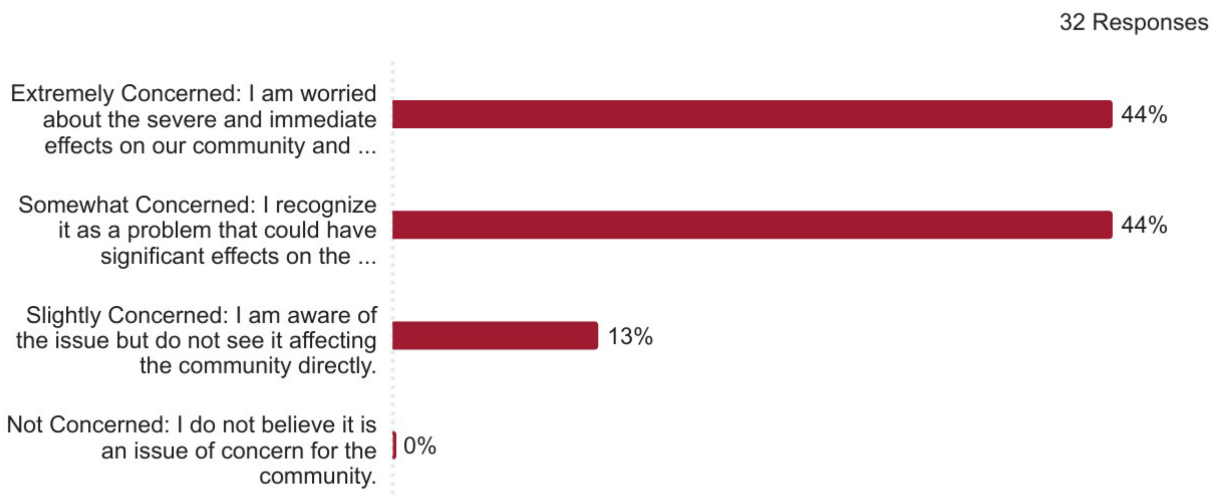
35

How has your concern about coastal erosion changed in the past 5 years?

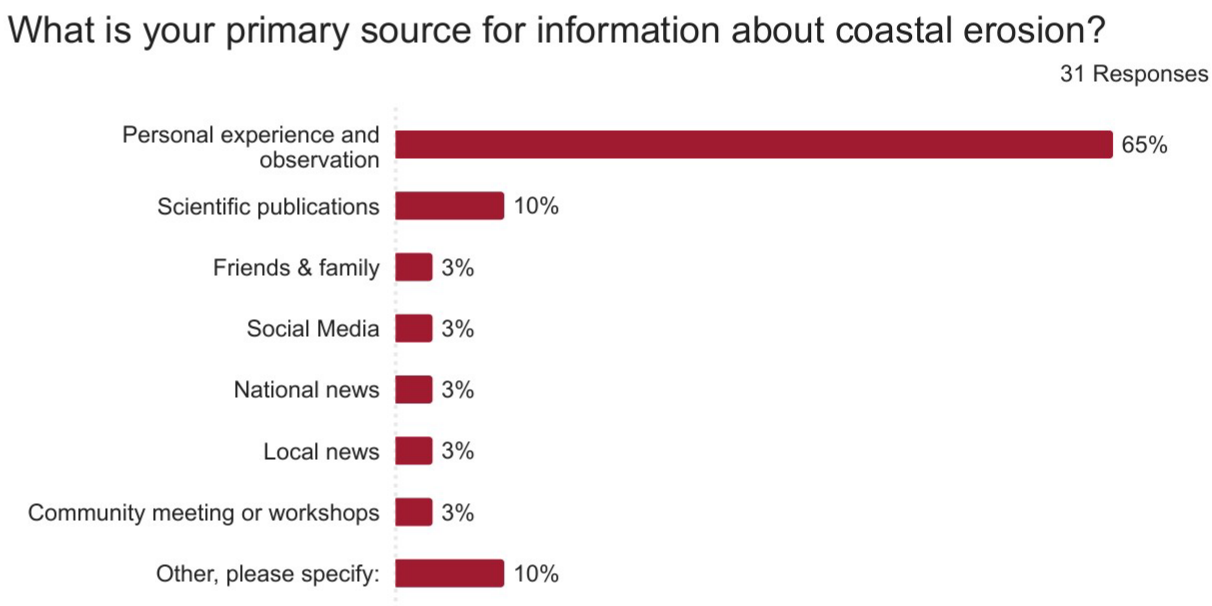


36

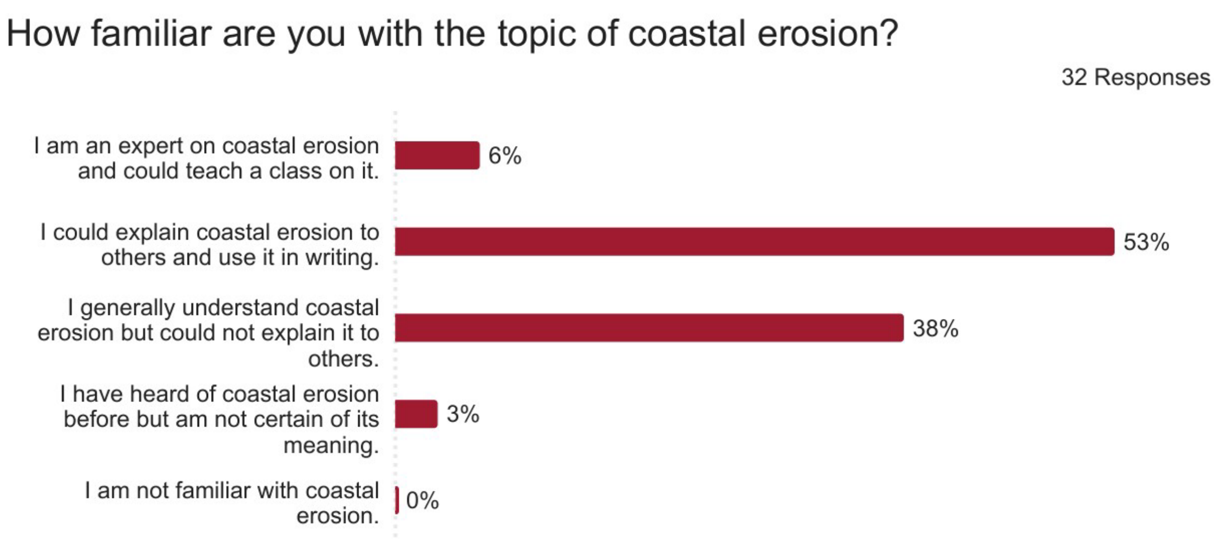
How worried are you about coastal erosion along this shoreline?



37

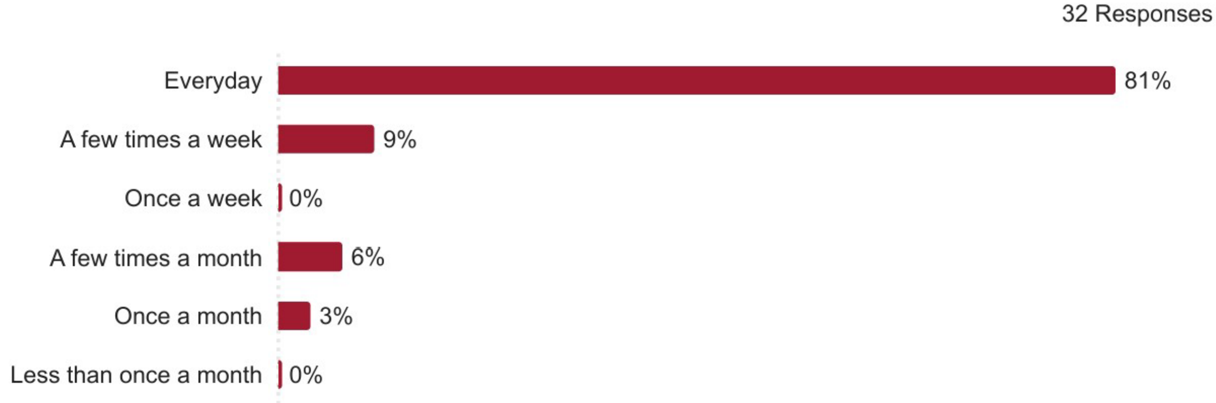

What is your primary source for information about coastal erosion?
31 Responses
Personal experience and observation
65%
Scientific publications
10%
Friends & family
3%
Social Media
3%
National news
3%
Local news
3%
Community meeting or workshops
3%
Other, please specify:
10%

38


How familiar are you with the topic of coastal erosion?
32 Responses
I am an expert on coastal erosion and could teach a class on it.
6%
I could explain coastal erosion to others and use it in writing.
53%
I generally understand coastal erosion but could not explain it to others.
38%
I have heard of coastal erosion before but am not certain of its meaning.
3%
I am not familiar with coastal erosion.
0%

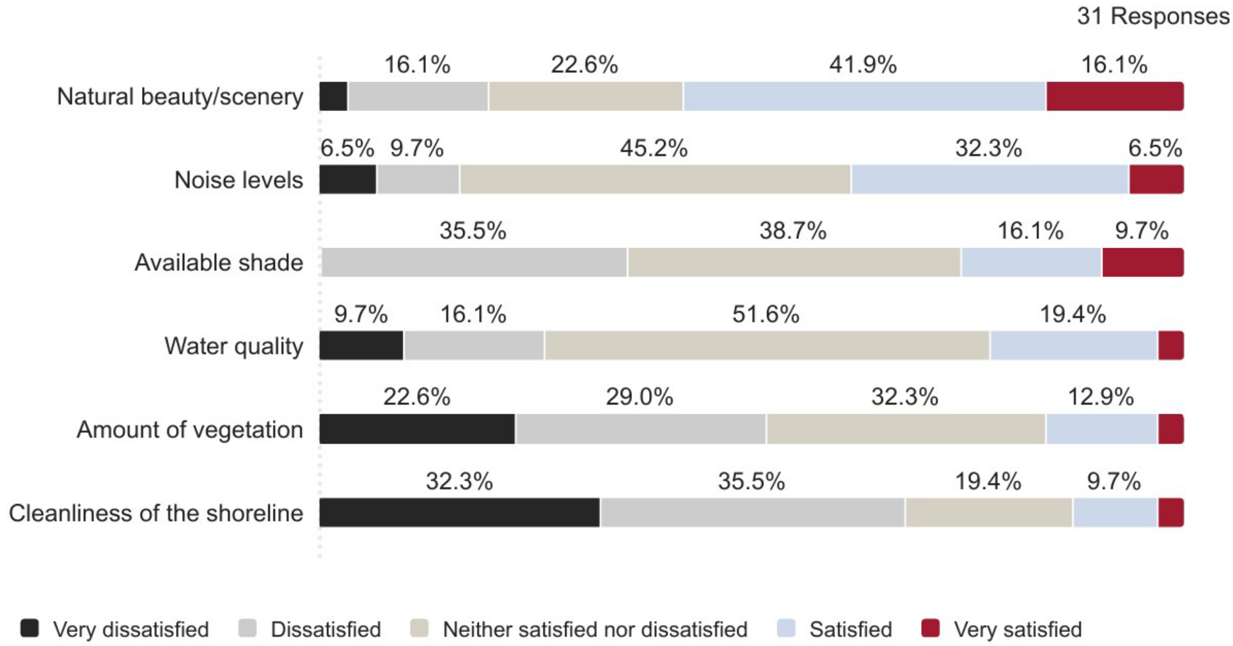
39

How often do you travel on State Road A1A past this area for reasons other than visiting this shoreline?



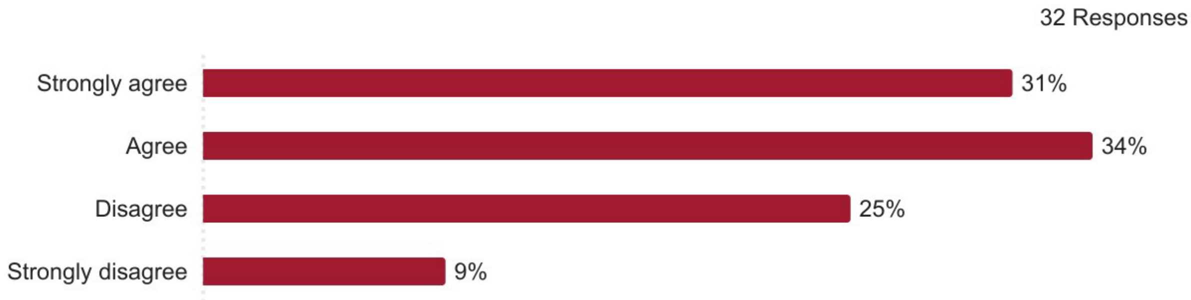
40

Please rate the extent to which you are satisfied or dissatisfied with the...



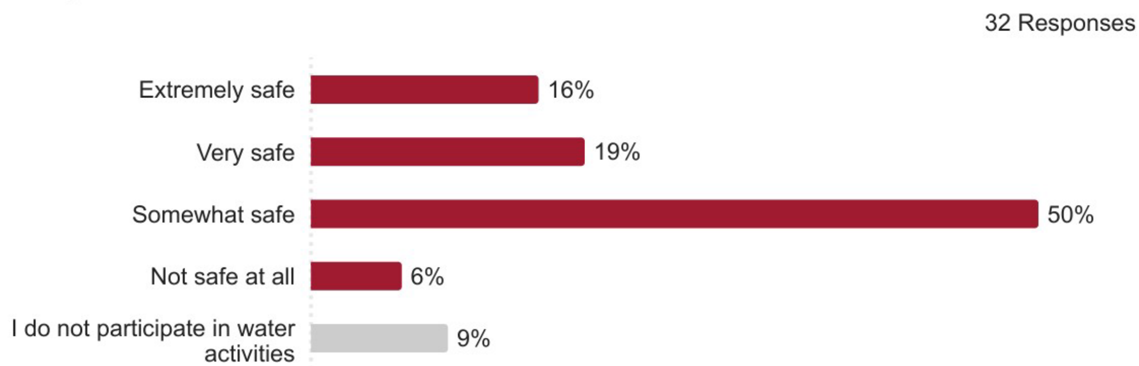
41

To what extent do you agree or disagree with the following statement: This shoreline is a family friendly space.



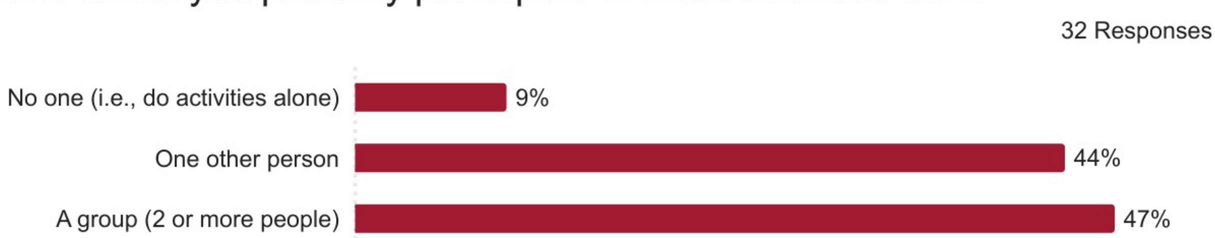
42

Considering water depth, clarity, and current, how safe do you typically feel doing activities in the water here?

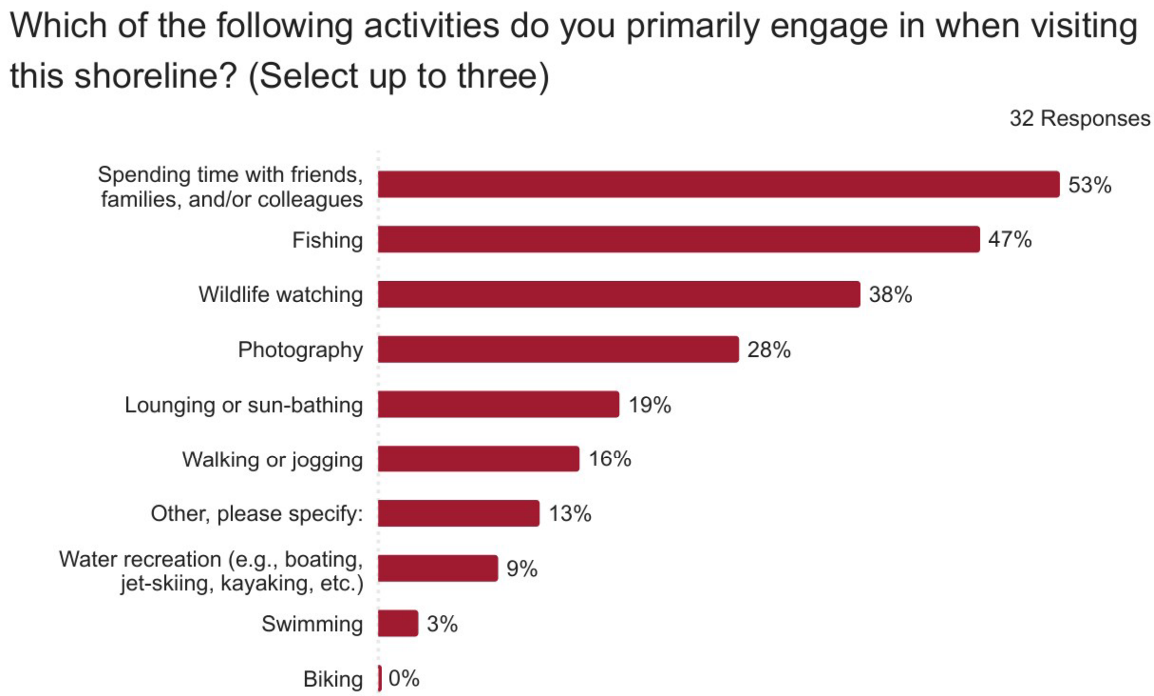


43

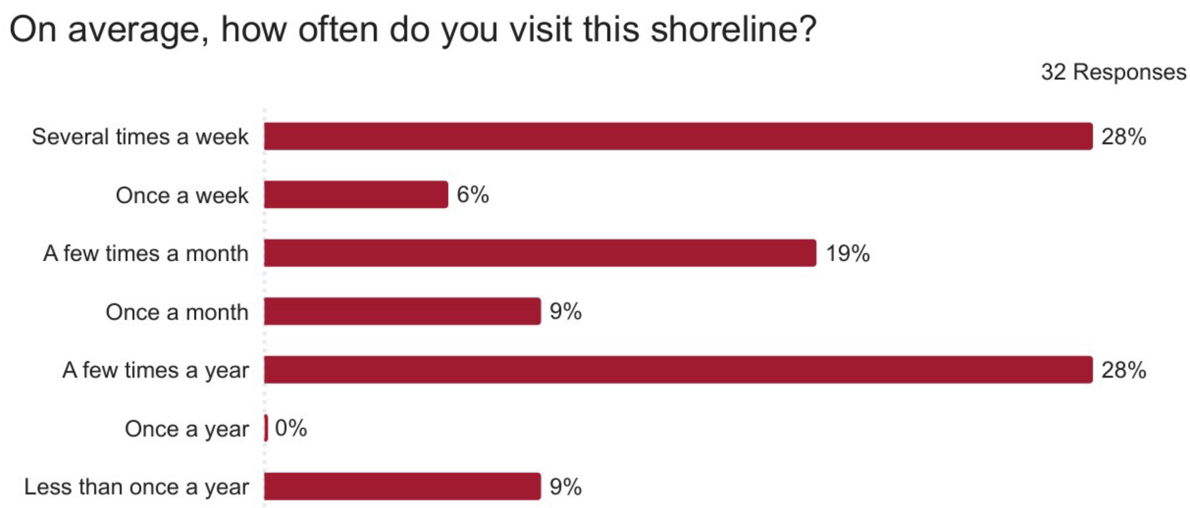
Who would you primarily participate in these activities with?



44


Which of the following activities do you primarily engage in when visiting this shoreline? (Select up to three)
32 Responses
Spending time with friends, families, and/or colleagues
53%
Fishing
47%
Wildlife watching
38%
Photography
28%
Lounging or sun-bathing
19%
Walking or jogging
16%
Other, please specify:
13%
Water recreation (e.g., boating, jet-skiing, kayaking, etc.)
9%
Swimming
3%
Biking
0%

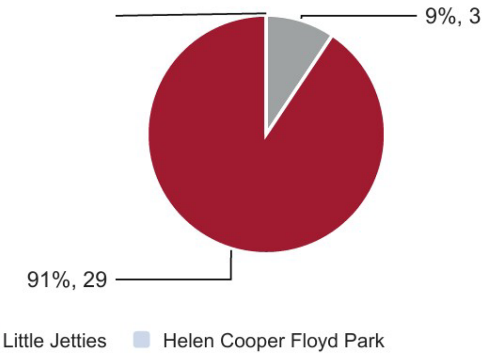
45


On average, how often do you visit this shoreline?
32 Responses
Several times a week
28%
Once a week
6%
A few times a month
19%
Once a month
9%
A few times a year
28%
Once a year
0%
Less than once a year
9%

46

How do you typically refer to this shoreline?

32 Responses



47

Appendix C – Mayport, Florida Design Alternatives

Figure 21: Concept 1 Alternative 1

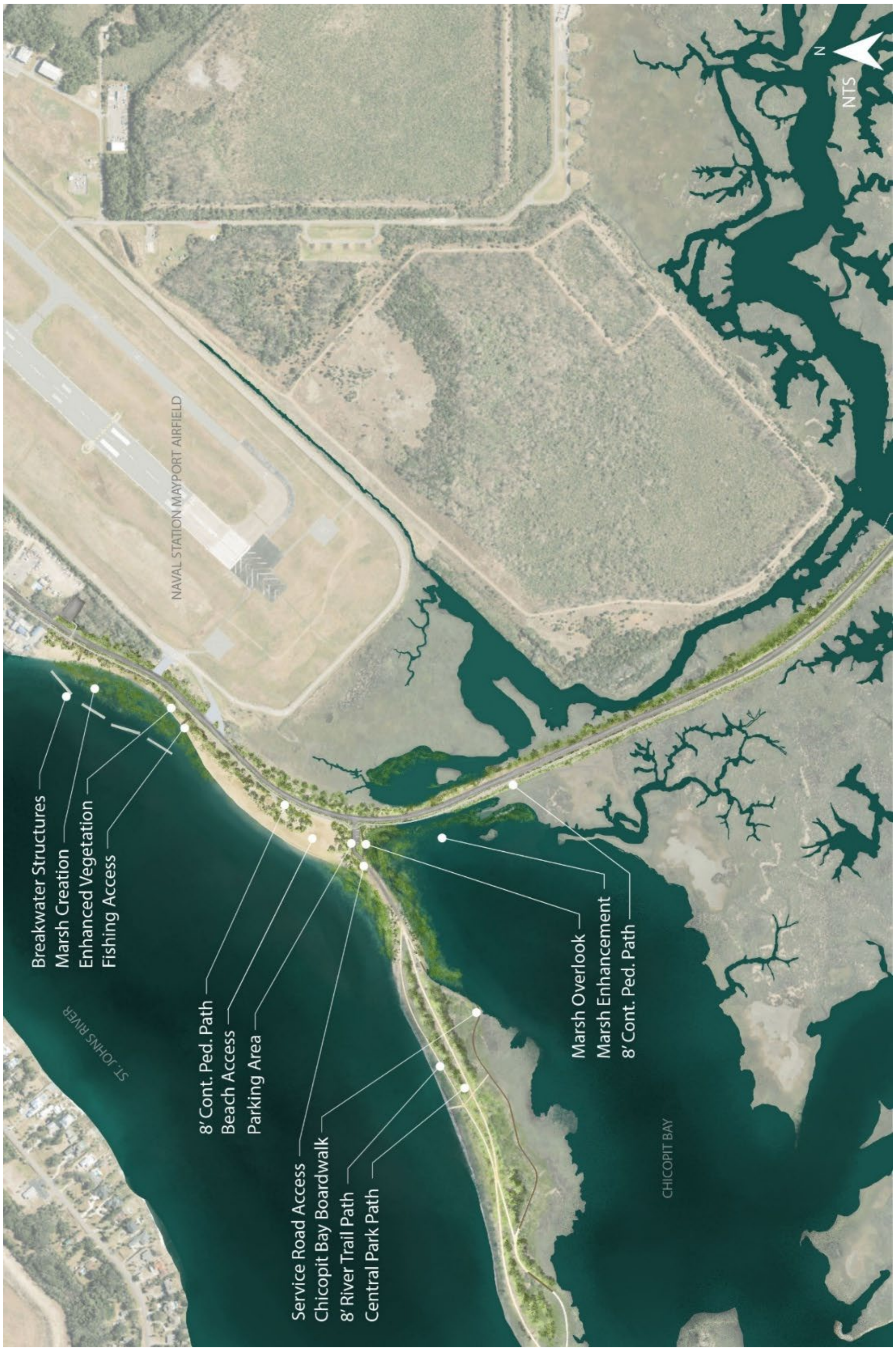


Figure 22: Concept 1 Alternative 2

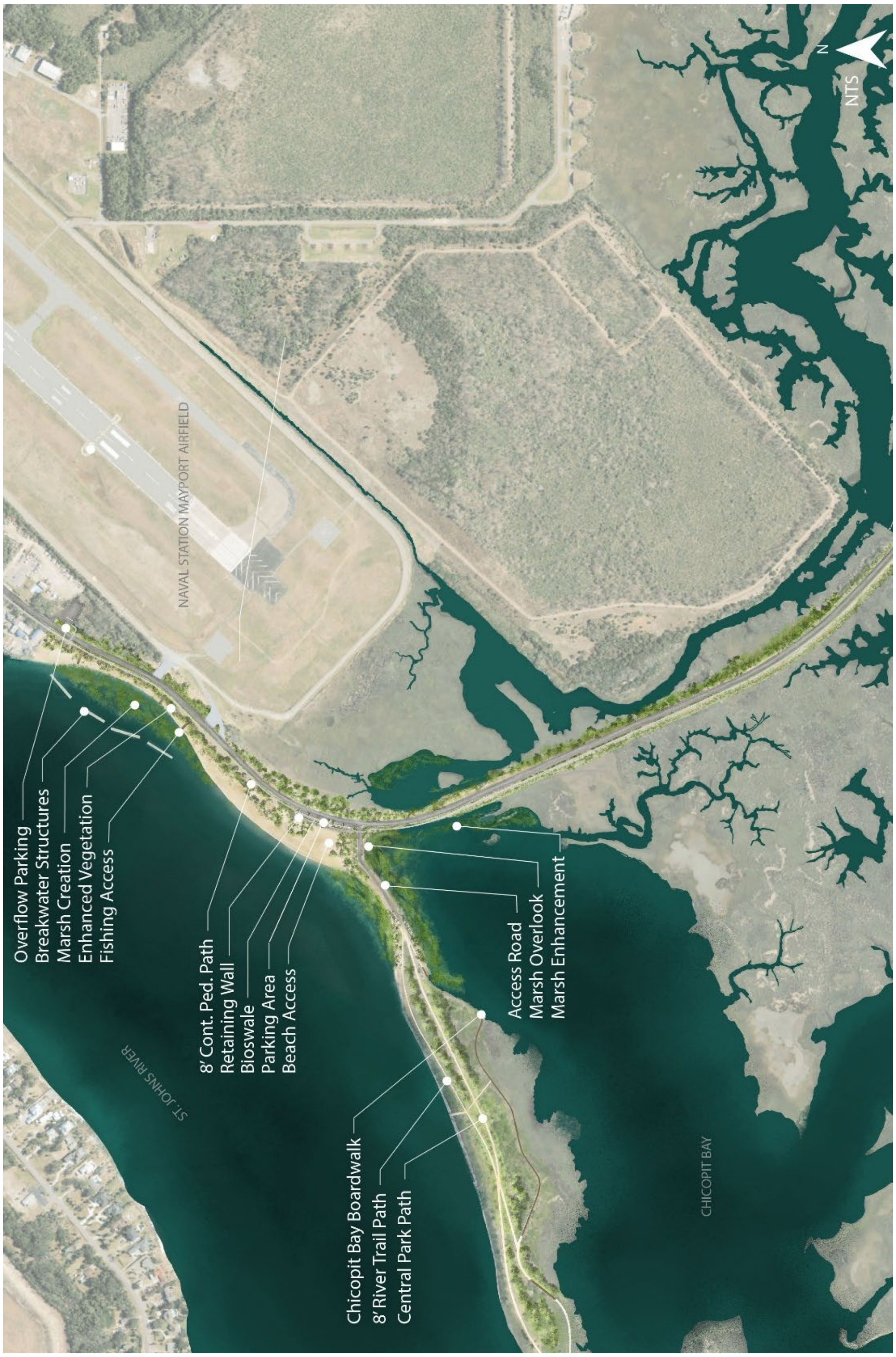


Figure 23: Concept 1 Alternative 3

Figure 24: Concept 2 Alternative 1

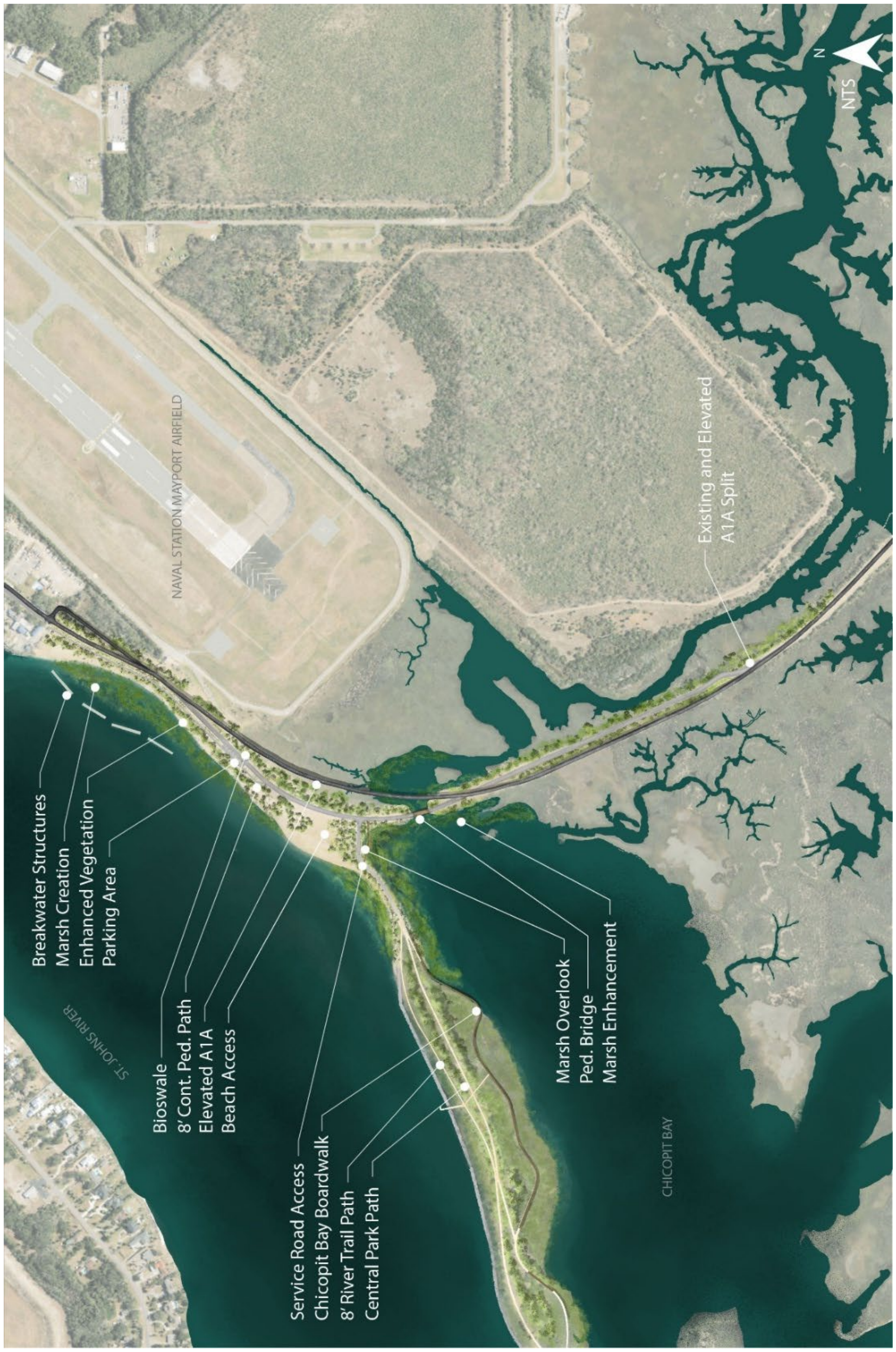


Figure 25: Concept 2 Alternative 2

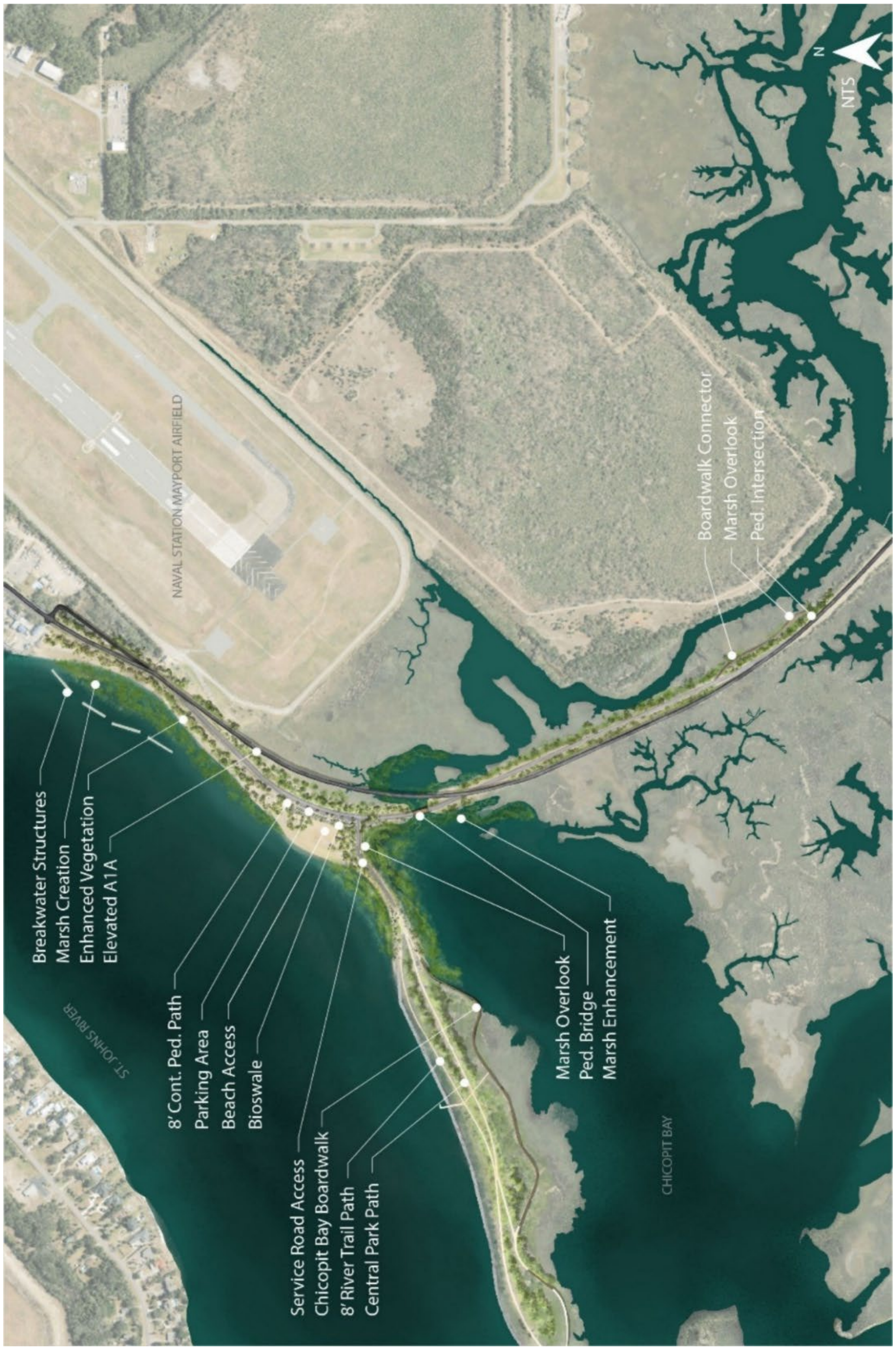


Figure 26: Concept 2 Alternative 3

Appendix D – Dutch Dialogues and Tampa Bay Ready Case Studies

Certain characteristics make a city well-suited for a Dutch Dialogues intervention. These include strong collaboration across government entities, a clear vision for the city's future, water-related challenges and key assets that the city wants to protect.

Dutch Dialogues: New Orleans

The New Orleans Dutch Dialogues was the first of its kind. To create a system where New Orleans could survive, prosper and grow, specialists collaborated to imagine a layered approach to living with and making the most of water's unique and abundant opportunities (Tolford, 2021).

The first official Dutch Dialogues community engagement workshops were held October 10 through 13, 2008 (Willner, 2016). Prior to the October 2008 workshops, however, meetings at the Port of New Orleans Headquarters were held in addition to a trip to the Netherlands in 2006 (Meyer & Nijhuis, 2013). Data-driven, localized community engagement workshop and experimental framework takes years to prepare and execute (Waggonner & Ball, 2019b). Waggonner and Ball report learning how to refine and improve upon the process with each Dutch Dialogue workshop (Dale Morris, 2019). Each city requires different approaches and solutions for its unique water-related challenges.

The mindset of these workshops was to think about the future of New Orleans as more than simply repairing the damage left following Hurricane Katrina in 2005 (Burdett, 2024; P Hermens et al., 2010; Peter Hermens et al., 2010). The process was intended to be largely imaginative, yielding new ideas on what the city wanted to be, which key qualities they wanted to retain and what they desired the city's identity to be moving forward (American Planning

Association, 2009). This approach guided the intentions of the Dutch Dialogue to develop illustrative ideas about redevelopment rather than prescriptive solutions (Wesselink, 2007).

The Process

At the beginning of the first community engagement workshop, Dutch experts visited New Orleans to better understand the political and planning landscape of the city. The Dutch came to "see and smell and walk" the city to better understand the conditions and unique characteristics of the local landscape (Waggonner et al., 2014b). American counterparts from Louisiana and visiting locations joined the Dutch experts and the group was given broad instructions to develop illustrative plans (Willner, 2016). The focus of the plans was how water can add to the quality of life and spur economic development within the New Orleans Delta.

The group was then divided into three sub-groups, each tasked with addressing a specific scale: the regional scope of metropolitan New Orleans, the city district of Gentilly and the Hoffman Triangle, a neighborhood in the Uptown District (Waggonner et al., 2014b). Throughout the workshops, the groups intentionally worked separately to avoid haphazardly integrating the scales and to maximize solutions at the distinct intended scales (Wesselink, 2007). Groups additionally relied on layered, informative site data concerning opportunities, constraints, conditions and challenges (Wolff, 2018). They combined this layered approach with an intentional effort to respect New Orleans's existing identity, avoid radical or destructive changes and integrate their proposals into the existing urban environment (Environment, 2023).

Following preliminary inventory, analysis and group meetings, five major structuring elements were identified for the regional New Orleans strategy: natural environment, the Mississippi River, Lake Pontchartrain, canals and historical authenticity (American Planning Association, 2009). To support the overarching mission of creating safety for New Orleans, the team additionally identified four key 'backbones,' or structure-supporting elements: the strong levee and coastline of Lake Pontchartrain, the string levee and river esplanade along the Mississippi, the Gentilly Ridge and Claiborne Avenue. Each of these identified structures is a component of the New Orleans drainage network (American Planning Association, 2009).

After identifying the essential drainage network structures and backbones, design teams at each level let a set of principles guide design. The principles of development, s*afety, stormwater storage, a healthy environment and a high quality of life* were the foundations of the redevelopment imagining.

Each level of design proposed a series of unique design elements tailored to their designated area, all contributing to the greater redevelopment plan (Zevenbergen et al., 2013). However, a few potential design features were identified early on for the greater redevelopment plan. Following Dutch methods, early recommendations for the redevelopment plan highlighted the need for increased water storage capacity and an improved pump system (Meyer & Nijhuis, 2013). These techniques are often combined in the Netherlands to effectively manage localized flooding and improve water table management and risk levels (Wesselink, 2007). This feature's protection makes it a critical component of the proposed system redesign.

To best serve the designated environmental and quality of life principles, the new plan should include solutions based on current infrastructure and key locations (P Hermens et al., 2010). New canals should be included in New Orleans East to create water storage and an appealing urban environment where people can enjoy living near water (Zevenbergen et al., 2013). Existing canals should be redesigned to replace their concrete and hidden appearance with sustainable, natural features that are visually and functionally inviting (American Planning

Association, 2009). Urban parklands could be used for water storage, supporting recreation and ecological health.

To further enhance the comprehensive plan, strengthened levees along the lake and river would enhance safety and enable new opportunities for economic development, housing and tourism. Compartmentalization could restore key boulevards with green spaces, parks and mixed-use developments while supporting future public transit expansion. Wetland restoration in Lake Borgne and the bayous north of Saint Bernard would establish resilient ecosystems, improve sustainability and enhance recreation, tourism and flood protection.

Proposals

The four-day workshop gave participants the opportunity to sketch a long-term vision for New Orleans, integrating the predefined structures, backbones, principles and tangible solutions. Three main solutions came out of the meetings.

The first is a *super levee* along the Lake Pontchartrain waterfront. The levee would improve flood protection by providing a lakeside boulevard with palm trees, parks, marinas and mixed-use developments like hotels, shops and housing (Turner & Zedlewski, 2016). This solution would supply New Orleans with a new waterfront and an updated identity for the lakefront and surrounding residential areas (P Hermens et al., 2010). A wetland between the new and existing levees would act as a bio-filter and safety valve, storing and treating rainwater naturally, improving the lake's water quality and serving as a wet-dry buffer to support water circulation during dry periods (Orleans, 2017; Waggonner et al., 2014a).

The second solution is to create *islands* in the lake. New islands in the lake would reduce storm and wave energy while offering spaces for nature, recreation and fishing (Orleans, 2017; van Asselen et al., 2024). Accessible by boat or bike, they could serve as peaceful retreats for dining, beach walks and swimming. The islands' northern shores would be designed to break waves, ensuring the lagoon water stays refreshed, while the southern shores could feature sandy beaches for recreation (American Planning Association, 2009).

The third and most expansive solution, the *Cascade*, strengthens the city's water storage capacity (American Planning Association, 2009). The Cascade, a hydraulic system of water elements, runs perpendicular to the Mississippi River and redevelops the city's hidden canals into open waterlines (Orleans, 2017). This system would retain, store and manage water, stabilizing groundwater levels to reduce flooding and slow subsidence (van Asselen et al., 2024). During storms, the Cascade would store excess rainwater, while in droughts, it could be replenished with river water.

The Hoffman Triangle, one of New Orleans' most flood-prone and socioeconomically vulnerable neighborhoods, faces compounded challenges of poor drainage, severe subsidence and decaying infrastructure (Erkens et al., 2015). Additionally, the area's drinking water system leaks millions of cubic meters annually and the sewer system struggles to function during storms (Orleans, 2017). Frequent and heavy rainfall overwhelms existing drainage systems, while over-drainage causes soil to compact and sink at a rate of 1 cm per year. This ongoing sinking damages roads, buildings and utilities, creating a costly and repetitive cycle of infrastructure failure.

Most of the neighborhood's water challenges correspond to what is happening below ground, stemming from its geography and soil conditions (Baptist et al., 2021; Prominski et al., 2023). The high ground near the Mississippi River differs from the lower, peat-like soils prone to water retention and subsidence (van Asselen et al., 2024). The fluctuating groundwater levels worsen flooding during storms and accelerate soil collapse during droughts (Zevenbergen et al., 2013). A design such as the Cascade would aid this strategy by allowing for higher-density development in safer areas, while more vulnerable zones could transition to lower-density uses (American Planning Association, 2009). If implemented at grade, this solution could transform public spaces. Supporting the Living With Water mission, the Cascade would serve as a recreation zone where people can reorient themselves towards water, turning it into a positive part of daily life (Orleans, 2021). Linking neighborhoods and neighbors would strengthen urban connections while reducing flood risks and subsidence issues (Meyer & Nijhuis, 2013).

Lessons Learned

Following Dutch Dialogues New Orleans, a insights from people and communities was compiled. The list continues to guide Waggonner and Ball's planning and design work. The reflections inform guiding principles for similar coastal, process-based projects. The lessons learned are a culmination of statements made post-Dutch Dialogues New Orleans (American Planning Association, 2009).

Value the past and learn from how people lived before but remain flexible enough to adapt. Adaptation varies by place and with it, mitigation can make a meaningful impact. Culture and topography are pivotal considerations and design must respond to scale using the smallest scale that works effectively. While polymaths belong to another era, today's challenges demand teamwork and collaboration. We must learn from others; 350 years in America is a brief history. Respect the inherent patterns of the land. Landscapes grow, heal and protect and trees shelter us as we live within nature's rhythm, not apart from it (American Planning Association, 2009).

Infrastructure shapes places for generations and must go beyond engineering, integrating thoughtful design and ongoing maintenance. Disasters, though challenging, offer opportunities for learning and change, requiring preparation and collaboration across generations. Building an industry that unites environment and adaptation is essential, as is valuing and supporting those who do the work. Education is key; inform children and the broader community. Organizing is just as important as funding when implementing change (American Planning Association, 2009).

Above all, embrace uncertainty, engage fully with the present, love the places you care about and give what you can to them. By reflecting on the experiences of Dutch Dialogues New Orleans, future planning and workshop teams can avoid repeating mistakes, refine their methods and build on the successes from past projects. These lessons help to adapt approaches to different contexts. No two projects are identical, but patterns often emerge that can inform future decisions and planning strategies (Waggonner & Ball, 2019a).

Dutch Dialogues: Charleston

The second case study and application of Dutch Dialogues was in Charleston, South Carolina. As the second city to engage in this collaborative, participatory framework, the Charleston project resulted in a more detailed final report. This report provides deeper insights into the framework's core mission, the approach to community engagement, the pressing need for action and the step-by-step implementation of its interdisciplinary strategy.

Similar to the New Orleans project, Charleston's Dutch Dialogues was an effort to make the historic water city safe. Being the water city it is, the issues that need attention are surge, tidal, stormwater, drainage, surface and groundwater. To address these issues, the simplified and underlying motto and design inspiration is slow, store and drain. To responsibly plan to keep Charleston safe, these key features are meant to be incorporated into the design process. As with the New Orleans project, Dutch Dialogues is a process, not a prescriptive formula. The deliverables are not meant to be engineering plans and documents. Rather, the deliverables are meant to be illustrations, visionary options and data-informed, design-centric proposals. The imaginative redevelopment process is intended to provide outlets for water and preserve the city's identity and legacy (Government, 2020; Waggonner & Ball, 2019b).

Scope

The tale of Charleston's resilience will depend on how the city invests to adapt and preserve its natural and man-made assets. The Historic Charleston Foundation and the City of Charleston launched Dutch Dialogues Charleston to conceptualize a Living With Water future. Inspired by the Dutch's consistent efforts to live with water rather than fight it, the mission became about making the most of water as a resource, capitalizing on the near and long-term benefits (Architects, 2013; Orleans, 2021). Like many coastal cities, Charleston is experiencing the limits of traditional "pump and drain" technology due to an increased recurrence of severe storms, nuisance floodings and sea level rise. To co-create and imagine integrative ways to adapt, Charleston selected four locations to plan for: the Lockwood Corridor/Medical District, New Markert and Vardell's Creek Area, Johns Island and Church Creek/West Ashley (Waggonner & Ball, 2019a).

Timeline

The process began in 2017 with initial meetings between Mayor Tecklenburg and key stakeholders to introduce the Dutch Dialogues and assess Charleston’s conditions. These early discussions involved groups such as the Charleston Resilience Network, the Water Institute, Waggonner & Ball, embassy staff, the American Flood Coalition and local organizations including the College of Charleston, Historic Charleston Foundation, South Carolina Sea Grant, city agencies and industry leaders. Building on these initial discussions, a series of engagement events took place in 2019 and concluded with the release of the final report in September (Government, 2020).

The Process

After the exploratory meetings of 2017, a Charleston delegation led by the Water Institute traveled to the Netherlands in October 2018 to study various flood control projects, ranging from large-scale surge barriers to smaller urban and rural water management systems. In January 2019, co-creative community engagement events began and continued in the months that followed. These meetings included Dutch Dialogue leaders, Dutch experts and key city, community and business leaders. During the sessions, foundational work for the designs was completed, including site visits, data compilation to assess current conditions and risks and lectures aimed at building partnerships and support (Government, 2020).

Colloquium

The Dutch Dialogues Colloquium held May 1–2 in Charleston, marked the first phase to include a wider group of participants beyond those in leadership roles. Over the two-day event, community leaders, stakeholders, professionals and residents engaged in discussions about the design agenda, available resources, data gaps and specific needs for designing key areas. Participants also identified missing stakeholders and potential partners. This gathering built on the ideas and conversations initiated during the earlier Netherlands trip, bringing together people from diverse professions and expertise to envision Charleston's future at multiple scales. Efforts prioritized a stronger, more resilient city that remains a vibrant and desirable place to live by fostering a united and engaged community (Government, 2020; Waggonner & Ball, 2019b).

The Colloquium meetings marked the end of the exploratory phase. The purpose of this phase is to move participants into the design phase by identifying potential issues and proposing potential solutions. Key takeaways included the acknowledgment that there were few surprises, solutions exist but need funding, there is a clear thirst for action, better communication and transparency about ongoing studies and efforts are needed and the South Carolina Department of Transportation should play a greater role in flood-risk mitigation due to its control over critical infrastructure. Dutch participants reflected that Charleston's resilience is a complex story that must be explained in a simple way, safety comes in many forms, developers are not leading on resilience and there is a need to distinguish between engineering solutions for current problems and designing for the information now available (Government, 2020).

Design Workshop

The May Colloquium meetings provided both a checkpoint and a launchpad for the five-day design workshop held July 15–19. This workshop built on insights from earlier meetings and research conducted over the previous year. It included two public open houses, briefings for stakeholders and key City staff and several smaller stakeholder meetings. Discussions covered the history of each site, assessed potential risks, gathered community input and developed recommendations for Charleston. The workshop also produced multi-scale drawings created collaboratively by community members and specialists. Alongside general recommendations for the city, site-specific solutions were developed (Government, 2020; Waggonner & Ball, 2019b).

These recommendations combined broad design concepts with specific strategies to address water-related challenges. Rather than focusing on programming for people, the concepts prioritized strategies to safely integrate water into the urban environment, enhance ecological health and create new opportunities for access, recreation and scenic experiences. A key goal was to reconnect water with the communities living nearby. Proposed solutions included stormwater detention in open spaces, bioswales in housing courtyards, elevated streets, tree-lined drainage easements, blueways, water plazas and daylighted creeks. Additional measures included green roofs, rain gardens, pervious pavers, water storage cells, cisterns and public water features (Waggonner & Ball, 2019b).

Dutch Dialogues Relevance to Mayport

As the first project of its kind, Dutch Dialogues New Orleans did not follow a strictly linear path. Instead, it emerged organically in response to the devastation caused by Hurricane Katrina. Its organic development emphasizes the effort required to develop a methodology and project of this scale and effectively respond to region wide challenges at a variety of scales. The case study additionally reveals that the project's success relies on willing partners across various disciplines, nations, levels of authority and areas of expertise (Architects, 2013; Waggonner et al., 2014b).

The widespread familiarity with the devastation experienced by New Orleans in the aftermath of Hurricane Katrina provides perspective to the significance of this approach. This project conveys that effective and resilient co-designing around water challenges needs to address challenges at a systemic level, rather than isolating individual issues. Conditions from below the ground to the broader cycles affecting a place's water systems need to be fully considered to ensure solutions address interconnected challenges rather than isolated incidents. The Dutch Dialogue approach is relevant for Mayport, as it demonstrates the level of coordination and systems thinking necessary to develop effective and lasting solutions. Dutch Dialogues New Orleans shows us the first instance in which this specific process is applied to envision and propose system level design recommendations to plan for water related challenges, placing safety and communal well-being above all else (Council, 2014; Nelson, 2020; van Gils).

The Dutch Dialogues Charleston case study is valuable to our engagement process because it offers a detailed example of a process model and how it can be applied. The case study took an interdisciplinary, intergovernmental and international approach to creating data-driven, community-informed design solutions for the city's water challenges. It provides a timeline showing how much preparation and time are needed to execute engagement at this depth. The study also outlines an effective order for involving partners and stakeholders, starting with key leaders, experts and organizations before engaging stakeholders and residents. Since Charleston is a coastal city with similar water-related risks, the selected sites and the range of design recommendations offer useful insights for addressing shared challenges (Waggonner & Ball, 2019a).

Several key findings were identified as a result of the collaborative, Dutch Dialogues inspired regional effort, Tampa Bay Ready. Creative design processes can leverage the high-quality scientific and ecological knowledge in Tampa Bay to develop integrated, multi-benefit resilience projects (Rogers & Jackson, 2024). Flood risks occur at most elevations in the state of Florida due to Florida's flat topography, low elevation, storm surges, rainfall, high tides, sea level rise and groundwater fluctuation. Resilience strategies are widely replicable according to landscape typology (Environment, 2023). Regulations intended to protect the environment constrain the development of the new living infrastructure as seas rise. Interdepartmental collaboration strengthens resiliency projects and every project needs a collaboration champion (Wesselink, 2007). A multi-scalar approach is crucial to define problems and opportunities for resilience projects across jurisdiction boundaries. Defense strategies like sea walls and pumps have limited lifespans and may be necessary in the short term (Zevenbergen et al., 2013). However, adaptable strategies, such as elevation, natural buffers and targeted managed retreat, should be prioritized and anticipated.

Resilient Ready Tampa Bay

Resilient Ready Tampa Bay showcases how the Dutch Dialogues framework was adapted for use in another coastal region. Inspired by similar initiatives in New Orleans and Charleston, the Tampa Bay Regional Planning Council (TBRPC) collaborated with local, national and Dutch experts to address flood risks and climate-related challenges in three vulnerable communities. Charrette-style workshops were used as part of the process to engage stakeholders and professionals to develop actionable recommendations. Central to the initiative was recognizing that regional collaboration is essential for long-term sustainability.

The TBRPC, comprised of six counties and 21 municipalities, aims to unify local governments to coordinate planning for regional resilience. Resilient Ready Tampa Bay, a byproduct of TBRPC, focused on key steps throughout the process: engaging stakeholders, defining resilience challenges, assessing existing systems and projects, identifying values and priorities, creating design concepts and estimating costs. Future phases will include securing funding, further refining designs, navigating permitting, implementing construction and establishing maintenance plans for long-term effectiveness.

Launched in January 2022, the project began with a site selection process, followed by kickoff meetings in February and March. Three interactive charrettes were held in late April, culminating in a regional symposium on June 23, 2022. The site selection process evaluated landscapes based on the potential for systemic water management, public space improvements to reduce private property risks, replicability, conceptual clarity, decision-making impact, focus on physical spaces and benefits for underserved populations. The chosen sites, North Tampa Closed Basin, R.E. Olds Park/Oldsmar and Pass-a-Grille/St. Pete Beach represents the inland basin, estuary/bayfront and barrier island landscape typologies.

Charrette Findings

During the charrettes, participants advanced existing project ideas, refined design concepts for funding applications and explored replicable solutions. The multidisciplinary team included planners, designers, engineers, hydrologists and community stakeholders. The process began with site visits, discussions, concept integration and public open houses. Outcomes included flood mitigation designs and cost-benefit analyses critical for state and federal grant applications.

For the inland basin typology, recommendations focused on retaining water where it falls to reduce downstream flooding, incorporating natural systems into pond edges and streetscapes, creating public spaces near water and implementing buyout programs for properties with repetitive losses. For the estuary/bayfront, it was advised to gradually allow water to flow naturally, restore offshore habitats to improve water quality, mitigate wave energy to support structural elevation and establish first-refusal rights for flood-prone properties. In the barrier island typology, proposed measures included relocating infrastructure to higher elevations on the Gulf side, constructing and maintaining dunes to address sea-level rise and preserving public waterfront access for future adaptability.

The project site for the Mayport, Florida project has already been selected, so the selection process will not be needed as part of this project. However, it is still important to note the selection process of other case studies remains pertinent because they signal core project priorities and considerations necessary for similar to be as successful and effective as possible.