RUTGERS 2030
MASTERPLAN

PUBLIC ACCESS PLANNING STUDIO

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Graduate Planning Studio
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The following report contributes to the Sustainable Raritan Initiative
The Sustainable Raritan River Initiative, a joint program of Rutgers' Edward J. Bloustein School of Planning and Public Policy and the School of Environmental and Biological Science, works with stakeholders around the Raritan region to balance social, economic and environmental objectives towards the common goal of restoring the Raritan River, its tributaries and its estuary for current and future generations.

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The Nature Conservancy	**Elizabeth Schuster,** Environmental Economist
Rutgers University Recreation	**Dave Williams,** Executive Director **Jessie Stratowski,** Outdoor Recreation Coordinator

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EXECUTIVE SUMMARY

Formerly industrial communities like New Brunswick were centered on active river fronts. Economic, cultural, and social life often relied on public access to a waterway, despite the noxious pollution left behind by industrial production. After years of redevelopment, especially the construction of Route 18, the Rutgers University 2030 Master Plan is looking for ways to re-establish this connection between the city and its river. This return to the Raritan is not without obstacles, as there are various regulatory, funding, and stakeholder concerns to consider.

This report, produced by a team of graduate students at the Edward J. Bloustein School of Planning and Public Policy, is an examination of two elements in the Rutgers University 2030 Master Plan: a multi-modal bridge spanning the Raritan River and a boardwalk along the river's edge. Each element presents its own set of challenges and opportunities, which are outlined in the report from three perspectives: 1) access 2) environment and 3) health and safety.

The report provides context of the study area, the studio team's findings on the proposed projects from these three perspectives, and recommendations for their design and continued success. Note the task of this studio is not to provide engineered or architectural solutions, but conceptual suggestions that can be integrated into future designs. Seemingly contradictory recommendations for these large and complex projects can coexist when site-specific context is considered. These two elements present a great opportunity for Rutgers and a wide range of stakeholders to foster a renewed relationship with the Raritan River, not just as a transit route, but as a destination for Rutgers students, local residents, and visitors alike.

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RUTGERS 2030 MASTER PLAN

The Rutgers 2030: Rutgers University Physical Master Plan is a comprehensive document designed to reassess the needs and goals of each campus individually (New Brunswick, Newark, and Camden) and as part of the larger Rutgers University context. This document was created as a complementary physical vision to goals outlined in the Rutgers - New Brunswick Strategic Plan developed and adopted in February 2014.

Overall, the goal of the New Brunswick plan is to stimulate growth and help reconnect the five independent campuses across New Brunswick and Piscataway previously developed in piecemeal since their inception in 1766 (Image 1). Outlined in the plan are five core objectives, which range from campus connectivity to student life and health, wellness and recreation, to focus and prioritize proposed projects.

CAMPUS CONNECTIVITY - TRANSPORTATION

STRATEGIC ACADEMIC INITIATIVES

STUDENT LIFE

HOUSING

HEALTH, WELLNESS & RECREATION

Image 1: A visionary rendering of the future for Rutgers University - New Brunswick from the Rutgers 2030 Master Plan document.

PURPOSE OF THE REPORT

A group of graduate students, with input from a number of stakeholders and key organizations, developed this report to understand the implications of developing two projects from the Rutgers 2030 Masterplan. The findings of this report yields concerns and opportunities paired with proposed design recommendations for these projects.

The purpose of this report is to offer future administrators, potential funders, and concerned stakeholders design options to consider when further developing projects proposed in the Rutgers 2030 Masterplan. Each project, while visionary in its scope, requires a deep analysis of public access implications from the user scale perspective.

The following report offers a background analysis of existing conditions, implications related to health and safety, environment, access, design recommendations, regulatory considerations, potential funders, and programming opportunities.

The ultimate goal of this report is to provide on-the-ground insight into the details of these projects as it relates to public access.

ABOUT THE STUDIO

The Rutgers 2030 Master Plan Public Access Planning Studio is a graduate studio of the Edward J. Bloustein School of Planning and Public Policy. The Bloustein studios provide students with an inter-disciplinary opportunity to conduct hands-on research around real-life problems, to work with clients, and to devise team-based solutions.

The Raritan Studios apply this planning process to the river at our campus edge. The Raritan River has long been a part of Rutgers' culture and played a pivotal role in the founding of the colonial college amid New Brunswick's river-based commerce. The Raritan is even the muse of Rutgers alma mater, "On the Banks of the Old Raritan". As a result, the school developed planning studios to address area concerns that aim to protect and enrich this natural feature.

This semester-long studio exploration analyzes public access along the Raritan River through the scope of the Rutgers 2030: Rutgers University Physical Master Plan. The projects of special concern to this analysis include: the riverside boardwalk and the multi-modal bridge access route from the proposed transit hub to Livingston Campus.

The analysis explores issues related to the planning, regulation, environmental conditions, and public access around the two proposed projects. Together, the group developed a comprehensive report that analyzes these projects through mapping exercises, detailed characterization, public access goals, and concepts to consider.

Image 2: The studio team after the public presentation with client Frank Wong (fourth from left) and instructor Sara Malone (fifth from left).

STUDIO TEAM

The following students participated in the graduate planning studio.

Michelle Hartmann is pursuing a concentration in communication planning and information design. She works as a program associate with the Rutgers Cooperative Extension Water Resources Program where she assists with the design and implementation of green infrastructure projects throughout the state. Michelle's work focuses on how design and communication come together to foster community stewardship and create successful built projects.

Pranay Kumar is concentrating in Sustainable Energy and Transportation Management Planning. He is currently associated with the Center for Energy, Economics and Environmental Policy as a research assistant. He holds bachelor degrees in Electrical Engineering and Law and has wide experience in legislative, policy, and regulatory issues associated with the inception, planning and implementation of infrastructure projects in India. In order to address the global concerns of environmental degradation and climate change with sustainable development, he has returned to planning school as a full time student to learn as well as to contribute by marrying innovative ideas and technological solutions with implementable plans, laws and workable business solutions.

Susana Gonzalez Rodriguez is an international student from Medellin, Colombia and obtained a Bachelor of Architecture degree from Pontifical Bolivarian University in 2014. She developed her interest in planning while working in the Medellin Municipality under the direction of the Private Secretary and Director of Planning. During her three years there, she participated in a team that supervised over 400 public infrastructure and architectural projects in the phases of conception and initiation, budgeting, architectural design, tendering and contracting, construction and put to use. Susana continues to pursue a career in the public sector; she currently works in the New York City Department of Transportation. Her interests are public spaces and urban design linked to bicycle and pedestrian transportation planning.

Sonia Szczesna has a combined concentration in environmental planning and policy. Sonia received a B.A. from Rutgers in Geography and Russian Language in 2013. Prior to returning to Rutgers for her graduate degree, Sonia interned at NASA DEVELOP where she used satellite data to develop agricultural suitability maps for farmers in Virginia and then moved to Turkey for a Fulbright Scholarship where she taught English in a small mining town and became interested in public spaces. She currently works at the Alan M. Voorhees Transportation Center and runs a student organization called Hub City Active Travel (HUBCAT), which seeks to empower the Rutgers/New Brunswick community to walk and bike together. Upon graduating, Sonia hopes to work in promoting the accessibility of public lands through conservation and education.

Casey Wolf is concentrating in International Development and pursuing a certificate in Historic Preservation. Recently, she interned with the Neighborhood Preservation Center, where she created a multimedia prototype for a series of walking tours, and researched and responded to public inquiries on historic preservation matters. She earned her bachelor's degree in Cinema and Media Studies from Carleton College in Northfield, Minnesota, and became interested in urban planning while working as a dog walker in suburban New Jersey.

Ying Xu is a degree candidate with concentrations in GIS and transportation planning. Having participated in the Fifth Community Scholar program by HCDNNJ and worked as research assistant at Alan M. Voorhees Transportation Center, Ying employs comprehensive methods to deal with every project, integrating statistical analysis, spatial analysis and graphic design in all her work. She achieved her Bachelor of Engineering in Urban Planning degree from Tongji University in Shanghai, China.

Chongrui Yang is pursuing a concentration in urban design, and her career aspiration is to be a professional urban designer. With her bachelor's degree in environmental engineering, Chongrui prefers sustainable and humanized designs in her projects, such as self-sufficient communities and green roof structures. Systematic study and training helped her master basic visualization tools, such as AutoCAD, SketchUP, and Adobe Creative Suite, to present vivid perspective views to clients. As an assistant in the Engineering department, Chongrui completed her summer internship in a Chinese real estate company, which fostered not only her working skills but also her efficient communication with clients and colleagues.

CHAPTER 1:
INTRODUCTION

THE BOARDWALK & MULTI-MODAL BRIDGE

In accordance with the Master Plan, a new bridge incorporating a pedestrian and bicycle pathway is proposed to connect College Avenue with Livingston through the existing Ecological Preserve. Based on the plan's priorities, it is important the project balance open space preservation with a new direct connection between Rutgers properties on either side of the Raritan River. In addition to acting as a link among campuses, the bridge will serve as a symbol of the potential of 21st century Rutgers – New Brunswick.

A walkway is envisioned along the New Brunswick side of the river to connect College Avenue and Douglass campuses (Image 3). Given the existing infrastructure, it would be accessible from stairs and ramps from the river's bluff (Image 4). In addition to acting as a thoroughfare for commuting students and faculty, the walkway allows recreation along the riverfront, reviving the connection to the river for the community as a whole (both the university and city residents).

Image 3: An aerial rendering of the project area, indicated in yellow, from the Rutgers 2030 Master Plan document.

Image 4: A visionary rendering of the proposed bridge over the Raritan River and boardwalk from the Rutgers 2030 Master Plan document.

Overall, both projects will prioritize collaboration and partnership with local constituencies. The goal of both projects is to increase recreational use and pedestrian connections throughout the existing necklace of parks surrounding the Raritan River floodplain.

THE UNIVERSITY CONTEXT

The proposed projects are primarily located in New Brunswick and Piscataway, municipalities in northwest Middlesex County within the Raritan River Watershed (Figure 1). Though inland, this stretch of the Raritan rises

and falls with the tides, hosting various migratory marine species. The New Jersey Division of Fish and Wildlife regulates the river downstream of Landing Lane as a marine water body. In the study area (Figure 2, shown in yellow), the boardwalk runs from the east end of the D&R Canal Trail, along the Raritan River near College Avenue Campus, through Boyd Park, ending with connections to the Cook and Douglass campuses. The proposed bridge will stretch from Deiner Park behind Hardenbergh Hall (slated for demolition in the 2030 Plan) across the Raritan River, and end in Middlesex County's Johnson Park, most likely within the municipal boundaries of Piscataway.

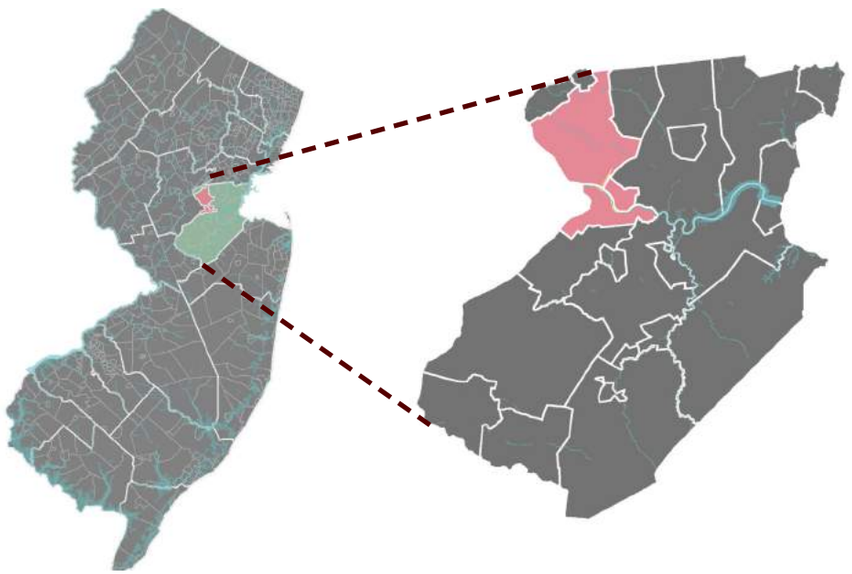


Figure 1 (above): The location of Rutgers' occupied municipalities within the state and county.

The Rutgers 2030 Master Plan also proposes a new trail through the Rutgers University Ecological Preserve to create a connection between the bridge's end in Johnson Park and Livingston Avenue Campus.

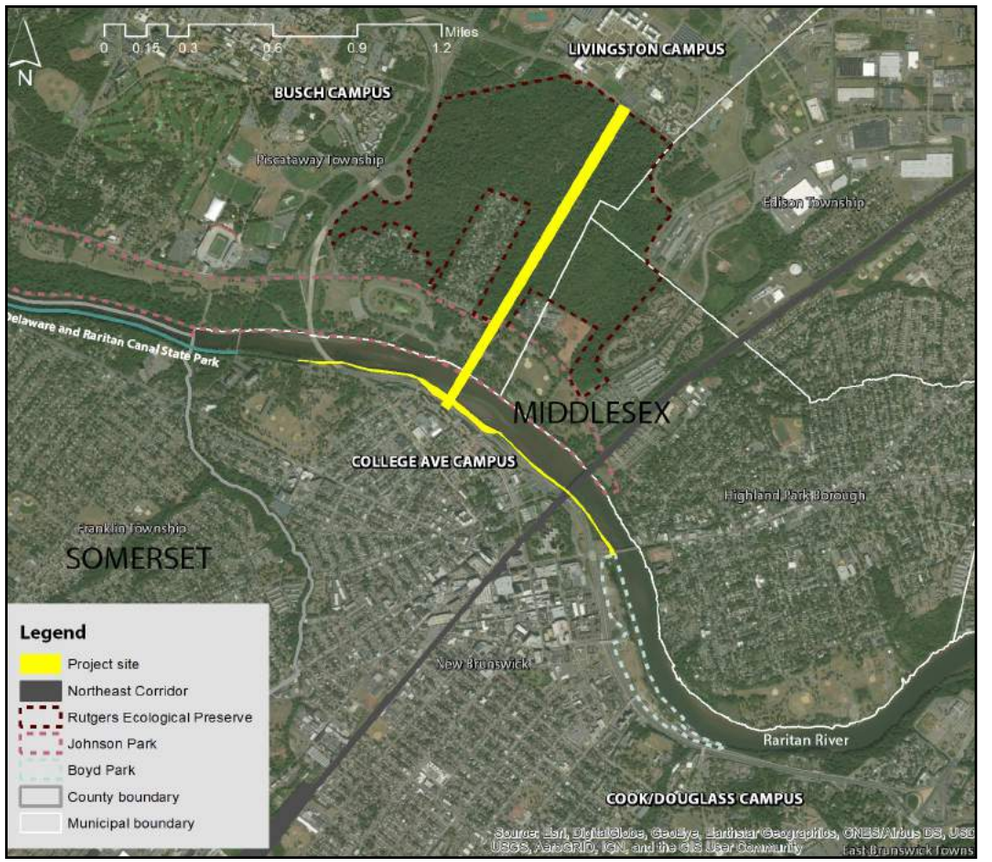


Figure 2 (above): A map of the project area highlighted in yellow.

HISTORICAL BACKGROUND

The City of New Brunswick, formed by royal charter in 1730, has long depended on the Raritan River as an economic engine and travel route. The Delaware and Raritan Canal (D&R) was built from 1830 to 1834, mostly by Irish immigrant laborers, to provide an easy and profitable passage for anthracite coal from Pennsylvania to New York City (Barth, 2002; Ferris, 2014). To account for changes in elevation, the canal relied on a sophisticated system of locks where water levels and canal barges would rise and fall like a bathtub. Where the Raritan River became navigable in New Brunswick, the D&R's only double lock system marked the end of the canal. Decommissioned since 1932, the canal now serves as a recreation area, historic district, and water supply, under the joint administration of the Delaware and Raritan Canal State Park, the Delaware and Raritan Canal Commission, and the New Jersey Water Supply Authority. The linear state park, which ends at Landing Lane, hosts over one million visitors every year.

Rutgers University was founded in New Brunswick as Queen's College in 1766, offering seminary coursework at the back of a tavern. With the passage of the Morrill Act in 1862, Rutgers became New Jersey's land-grant university, committed to the public good and the expansion of higher education to the working classes; this commitment lives on in the New Jersey Agricultural Experiment Station and the Rutgers Cooperative Extension. Rutgers' development in the New Brunswick area, especially since WWII, has been geographically scattered over five campuses and several academic buildings downtown. Across the river in Piscataway, previously agricultural land north of River Road (Figure 3), was reforested to become the Rutgers University Ecological Preserve in 1976, following the example of Kilmer Woods, nearby agricultural land that was reforested prior to the Ecological Preserve.

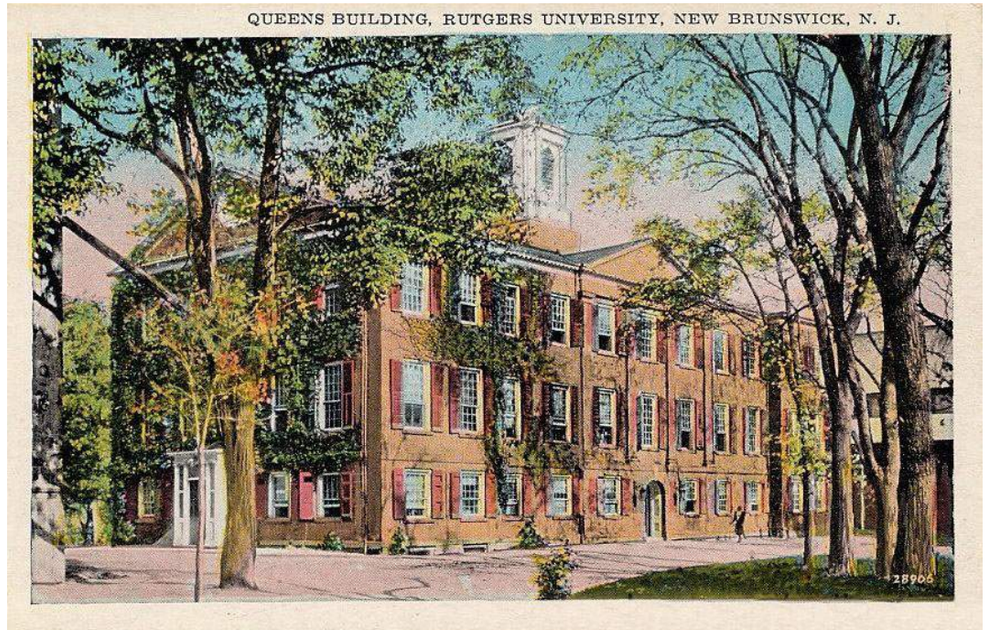


Image 5: A postcard of the original Queens Building from the Ken Lew Postcard Collection.

Raritan Landing, also in Piscataway, was a vanished and largely forgotten colonial-era port community spanning Johnson Park until various sewer

and construction projects, including Route 18's extension over the Raritan beginning in 2000, required archaeological surveys which unearthed artifacts and building foundations throughout the 80s, 90s, and early 2000s. East Jersey Olde Towne, a nearby open-air museum, hosts a permanent exhibit of Raritan Landing artifacts. The Route 18 extension had snaked its way along the river's edge in New Brunswick in the 1980s, buried a large section of the canal including Lock 13 (Figure 3), and completed its swoop over the Raritan into Piscataway in 2004. At the new endpoint of the canal, the construction created the spillway east of Landing Lane to manage canal overflow. As mitigation for Route 18's environmental damage, the NJDOT built the recreation courts at Deiner Park on a deck over the highway, and the Route 18 bikeway, a narrow path squeezed in between the highway and the river (Route 18 EIS). In the years following extensive renovations of Boyd Park and the section of Route 18 below Albany Street in the late 90s and 2000s, the area suffered several rounds of hurricane damage. The former New Brunswick police headquarters, just south of the Albany Street Bridge, fell victim to Hurricane Floyd in 1999. Boyd Park and Route 18 were inundated during Hurricane Irene (2011) and Hurricane Sandy (2012).

1 **RARITAN LANDING**

2 **KILMER WOODS**

3 **D&R CANAL LOCK 13**

4 **TERMINAL LOCKS**

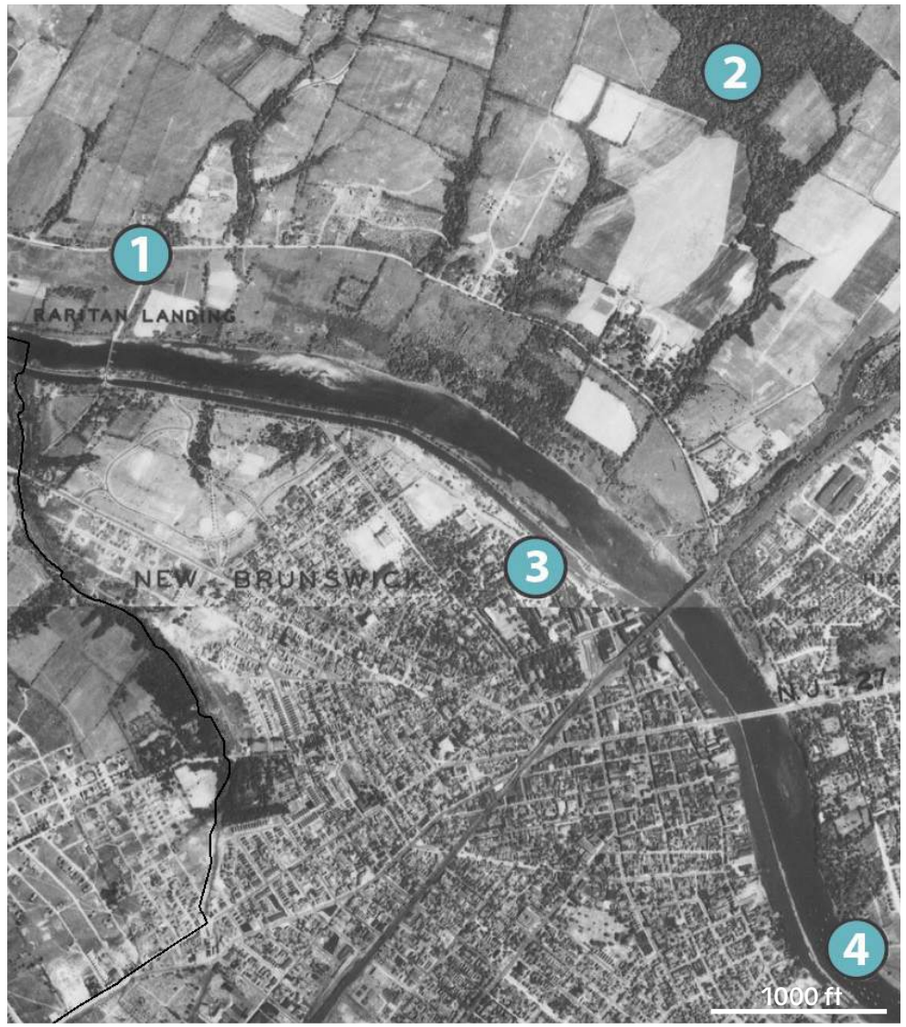


Figure 3 (right): The New Brunswick area in 1930. Source: NJ DEP NJ-GeoWeb.

The study area contains many more historical secrets now hidden from view on the landscape. There is no clear indication of the nation's first Independence Day celebration on the banks of the Raritan in 1778 or any remembrance of the enslaved people on the Underground Railroad who braved the dangerous route across the Raritan while slave catchers patrolled the Albany Street Bridge (Armstead et al, 2016: 94). There are no remnants of railroad tycoon Cornelius Vanderbilt's first successful venture, a hotel near the river south of Albany Street, or the Hiram Market neighborhood, a long-time haven for immigrant communities. After several waves of redevelopment, New Brunswick now stands as the largest missing piece of the D&R Canal towpath trail and historic district (Figure 4). Advocates for the canal, including the D&R Canal Watch, and the Rutgers 2030 Master Plan both recommend re-establishing a connection between the State Park and the canal terminus in Boyd Park to provide recreational continuity for the million plus users of the Canal State Park and reflect the historic centrality of the Raritan in New Brunswick daily life.

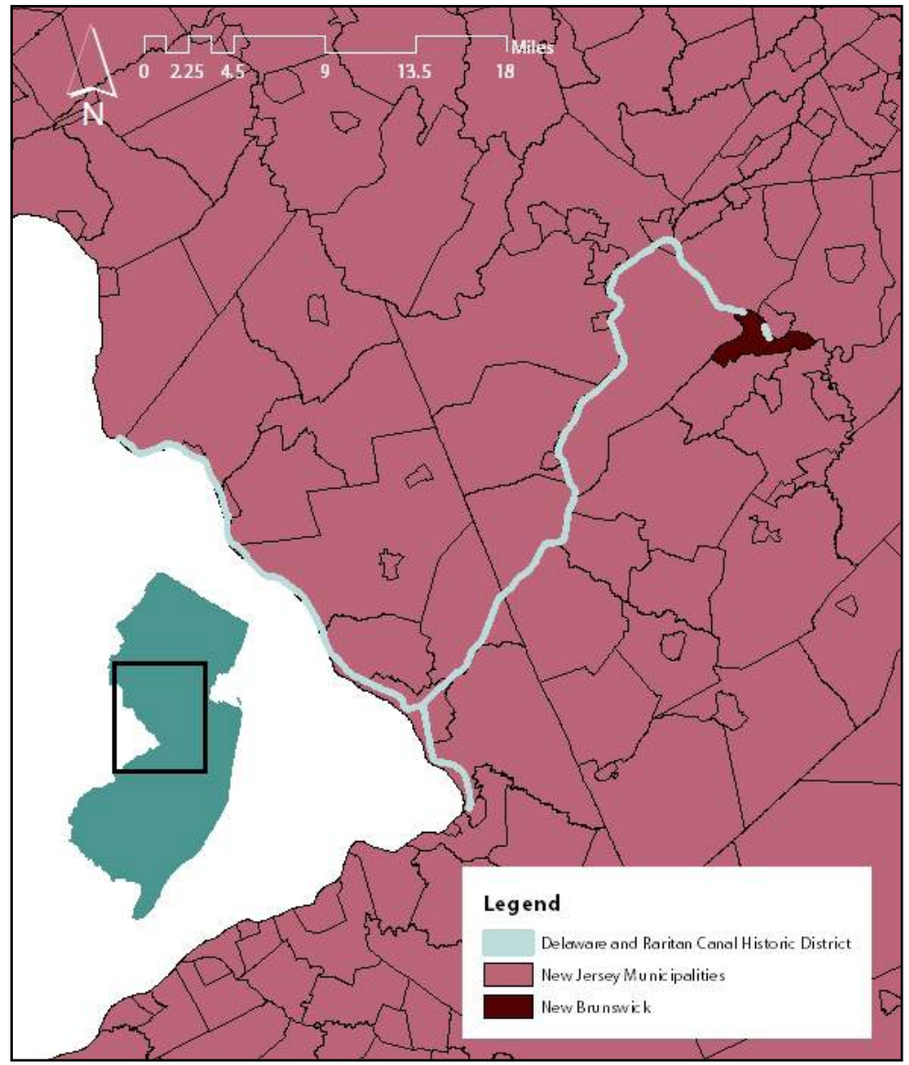


Figure 4 (right): The Delaware and Raritan Canal Historic District extending throughout Central Jersey and ending in New Brunswick. Source: NJ DEP Bureau of GIS.

USER DEMOGRAPHICS

New Brunswick's population is relatively young; nearly half are between 15 and 29 years old--it is home to many students attending Rutgers University and thus experiences significant fluctuations in population with the academic calendar. The city is home to a number of major institutions aside from Rutgers including three hospitals Robert Wood Johnson, St. Peters, and the Bristol-Myers Squibb Children's hospital, as well as the Johnson & Johnson world headquarters, effectively earning it the nickname the "Healthcare City". These institutions employ large numbers of people from both in and out of town (Robert Wood Johnson alone has 42,000 employees). As a result, the daytime population swells during business hours and depletes dramatically after 5pm. Employees coming to New Brunswick could take advantage of the bridge & boardwalk project in their commute and lunchtime hours as well, making it an attractive project for these institutions.

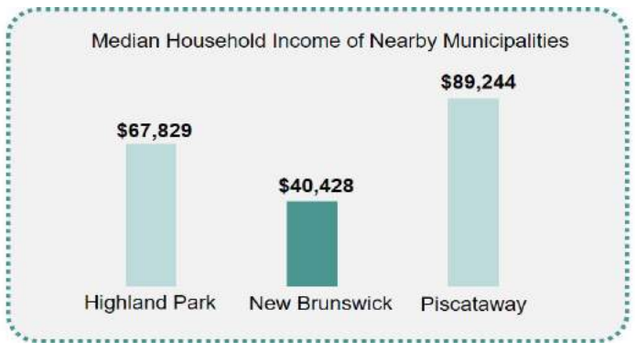


Figure 5: Household median income across Rutgers' neighboring communities. Source: US Census (2010)

New Brunswick's residents, major employers notwithstanding, make about half the household income of neighboring Piscataway (Figure 5). Most notably, a significant number of New Brunswick residents earn less than $10,000 a year with 35% of the population considered" below the poverty line". Most households own only one vehicle and many have none. Access to safe bicycle and pedestrian infrastructure is vital to these communities. Over half of residents speak a language other than English, 70% of whom speak English less than "Very Well" (Figure 6).

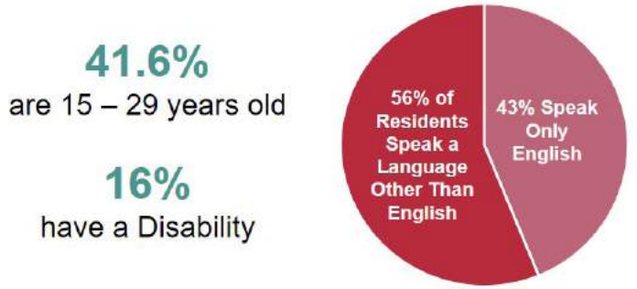


Figure 6: New Brunswick population's age, percent of disability, and primary language according to the 2010 Census. Source: US Census (2010)

Improvement of public spaces can encourage exercise and recreation to promote healthier lifestyles for both residents of the Health Care City and Rutgers University students. The bridge and boardwalk project could enhance public space availability and connectivity for Rutgers students, staff and employees, as well as local residents and commuters. It is important to note that 16% of New Brunswick residents have a disability, which is something that needs to be accounted for while planning physical infrastructure.

CHAPTER 2:
METHODOLOGY

METHODOLOGY

The studio team's research process emphasized a thorough understanding of the proposed site. While some team members were very familiar with New Brunswick, others were completely new to the area. To identify gaps and opportunities in pedestrian and bicycle access and assess the environmental conditions of the site, the team explored the area on foot, using notes and photographs to record observations. Additionally, Professor Richard Lathrop, the Rutgers Ecological Preserve Faculty Director, led the initial field visit through the Ecological Preserve, presenting its history through the character of its flora and fauna. The team also learned how Rutgers students use the area, observing projects and current research.

After exploring the Preserve, the group started down the bicycle lane running along the New Brunswick side of the Raritan River, flanked on its other side by Route 18. Officially named the Route 18 bikeway, the unkempt area is known locally as the "trench" in reference to its rough, claustrophobic qualities; these two names will be used interchangeably throughout the report. Starting in Buccleuch Park, the team traversed George Street at an inconspicuous crosswalk (Image 6). Passing near the canal spillway just east of Landing Lane Bridge and continuing under the Route 18 bridge, team members negotiated a dangerous Route 18 off-ramp pedestrian crossing to reach the trench. Here the group experienced first-hand the obstacles to safely accessing the space, the path's limited egress, and its severe lack of maintenance, among other things. At the end of the trench, the group explored the booths and performances at the Raritan River Festival and Rubber Duck Race taking place in Boyd Park.

This field work shaped many initial research topics. Each member of the studio took on the task of delving into a particular subject matter, including stakeholder outreach, environmental concerns, regulatory requirements, historic and cultural considerations, health and safety, circulation and

Image 6: George Street access to bike lane from Buccleauch Park from site visit on September 24, 2017.

transportation, and design concepts. This research entailed in-class lectures, expert consultation, stakeholder interviews, GIS analyses, data collection, and reviews of academic literature and research reports. To synthesize the individual findings, group members met to compile their research and devise a structure to present the information. The team discovered that there were three fundamental, overlapping perspectives through which to analyze these findings and consider the proposed projects, and that these perspectives were complementary to the core objectives of the Rutgers 2030 Master Plan.

Image 7: Existing pathway under Route 18 from studio site visit on September 24, 2017.

RESEARCH FRAMEWORK

The three perspectives the team used to organize the findings and recommendations of this report were: access, environment, and health and safety. Each principle represents an important aspect of the report related to the proposed projects' engagement with public access, which is the overarching topic of this studio, and each generates a series of research questions, some of which are listed below.

ACCESS

Ensuring public can effectively utilize and enter the space.

This includes both physical access (Can someone in a wheelchair easily get from Route 27 to the trench? How many access points does the trench have and how far apart are they?) and user access (What recreational opportunities will the bridge provide? What kinds of programming will help attract people to the space? Will bicyclists and pedestrians alike feel welcomed to the space? How about Rutgers students and New Brunswick residents?).

ENVIRONMENT

Minimizing negative environmental impacts and providing a pleasant space.

The environmental perspective involves avoiding or minimizing environmental damage while improving the undesirable conditions that the team noted through site visits and research. It accounts for state and federal

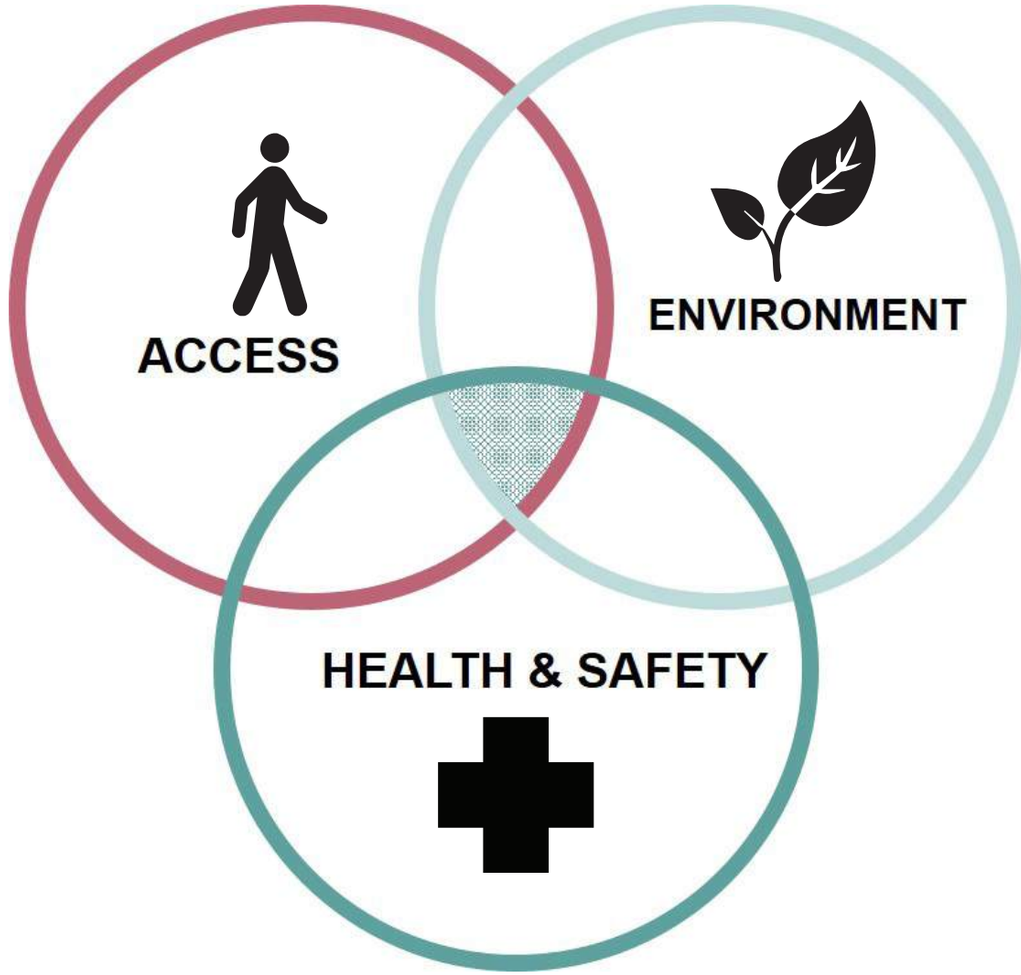


Figure 7: Diagram of methodological approach.

environmental regulations and considers any impacts the proposed projects would likely have on the existing conditions. (How will bridge pylons affect river ecology? How can the proposed design best mitigate exposure to noise pollution along Route 18?)

HEALTH & SAFETY

Ensuring the welfare and protection of the space's visitors.

This includes assessing and tackling real and perceived threats to mental and physical health in the project area, determining the best safety measures to mitigate these threats, and finding ways that the space can promote health and wellness. (What is missing from the space that could help users feel safe? What are the hazards associated with close proximity to water?)

These three content areas sometimes overlap and reinforce each other. For example, the limited points of egress on the trench are an access issue in and of themselves, but due to the lack of maintenance and users' perception of crime, they are also a health and safety issue. One of the three areas can also conflict with another perspective, e.g., paved pathways and round-the-clock access through the Ecological Preserve clashes with environmental concerns for the site. Depending on the weight given to each perspective, two people, armed with the same findings, may come to different conclusions. The studio team also weighed regulations, funding, and stakeholder concerns to develop well-rounded recommendations, outlined in Chapter 3.

CHAPTER 3:
EXISTING CONDITIONS

ACCESS| *Ensuring public can effectively utilize and enter the space.*

According to the Trust for Public Land's research on the New Brunswick park system, the city's parks lack adequate access. In particular, the report notes how the area along the Raritan River is underutilized for recreation by the general public and that there is little connectivity between parks (Trust for Public Land, 2011). Considering the distribution of Rutgers University campuses throughout the City of New Brunswick and Piscataway, creating a park network to enhance land connections presents value to not only the City, but also the University. Increasing park connectivity within New Brunswick would provide access to open spaces for Rutgers students and city residents to recreate, socialize, and relax, enhancing their overall river experience.

This report focuses on access to parks and paths along the Raritan River. The study area begins at the end of D&R Canal State Park, adjacent to the canal spillway and water supply intake (see *Project Context*). Just across George Street is Buccleuch Park, New Brunswick's largest city park totaling 78 acres (City of New Brunswick, 2016). The path referred to as "the trench" runs from this area to Boyd Park, along Route 18. The development of Route 18 (see *History*) severed the city's connection to the riverfront, leaving New Brunswick with only five points of access along the Raritan River. Some of these points are less functional than others, and all are hindered by the heavy traffic of the highway. The access points shown in Figure 8 are: (1) George Street Access, (2) Deiner Park Access, (3) Route 27 Access, (4) New Street Access, and (5) Commercial Avenue Access.

Figure 8: Existing access points to the bikeway along Route 18.

Of all the access points, George Street (Figure 8-1) is perhaps the most dangerous. From Buccleuch Park, the first pedestrian crossing that leads to the trench's walkway is a treacherous section of George Street as cars rarely abide by the road's speed limit of 25 miles per hour or stop for pedestrians

at the marked crossings. There is also a lack of sidewalks in this area, which limits College Avenue's connection to the river trail at this entrance. These shortcomings may be why motorists are not aware that pedestrians and bicyclists are active here. Just beyond this entrance, under the Route 18 overpass, the trail crosses the Route 18 off-ramp before continuing between Route 18 and the river. Here, there is no lighting, signage or other marking, such as a crosswalk, which would indicate a pedestrian crossing. The lack of crosswalk amenities does little to prevent cars from traveling close to 50 miles per hour through the area, forcing pedestrians and bicyclists to dart across the road to safety.

The next access point along the route is in Deiner Park (Figure 8-2), located behind the Rutgers Student Activities Center. Deiner Park (see *History*) is a small, concrete park which is owned by the City of New Brunswick, but maintained by Rutgers University. The Route 18 bikeway is connected to the park via a poorly maintained staircase and small bridge over the highway. This would provide a much needed egress from the path, however, it is constantly kept locked by Rutgers maintenance looking to keep Deiner Park free of vandalism and misuse. The locked gate, aside from being unsafe for path users looking to leave the area, reinforces the perception of crime in the area. This is one of the easiest access points to improve, by simply unlocking the gate, repairing the stairs, railings and associated seating, and periodically cleaning the area of vegetation and debris. Deiner Park is also the site of the proposed multi-modal bridge.

Beyond Deiner Park, the next egress point from the bikeway is at the Route 27 bridge (Figure 8-3). This connection has a concrete staircase with a "runnel", a divet in the staircase meant for walking with a bicycle. However, the runnel is on the opposite side of the railing, making it impossible to use for its intended purpose. This access point lacks ADA-compliant infrastructure or any ramp to make it accessible for those with impaired mobility. Approaching the area is difficult as well, as a pedestrian or bicyclist would have to navigate a busy route with multiple on-and-off ramps. This point leads into Boyd Park, which has two additional access points, but involves crossing underneath the Route 27 overpass, which is periodically a location for homeless encampments.

The New Street access (Figure 8-4) and the Commercial Avenue access (Figure 8-5) both lead directly to Boyd Park. Boyd Park is a 20-acre park that is home to parts of the D&R Canal towpath, the terminal locks of the canal, the Rutgers University Boathouse, and the docks at New Brunswick Landing (City of New Brunswick, 2016). This park is also the site of various festivals and events including the Raritan River Festival and Hub City Sounds. These two access points are significantly easier to navigate than the previous three, however, they still pose dangers associated with crossing a major highway. The Commercial Avenue (Figre 8-5) crossing of Route 18 was the site of both pedestrian and bicyclist deaths in the past five years and though the City has made improvements to both entrances, the length of the crossings combined with the lack of traffic separation and the speed of moving traffic, continues to support a perception of, if not actual, unsafe conditions (Ambrose, 2013).

ENVIRONMENT| *Minimizing negative environmental impacts and providing a pleasant space.*

While New Brunswick is largely developed, it is also host to a combination of wetlands, forests, and patches of natural habitats distributed throughout its 5.8 square miles (Figure 9). The study area is primarily flat due to its location within the Piedmont geological province, however the land generally slopes downward towards the Raritan River (Dombroski, 1980).

According to the Natural Resources Conservation Service (NRCS), there are primarily three soil types present in the study area (Agriculture, 2017). The soil types are Klinesville channery loam (KkoB), Klinesville Urban land complex (KkuB), and Rowland silt loam (RorAt). These soils are found in steep slope areas and the floodplain along the Raritan River (Figure 10). Based on NRCS data, each soil type has a different "risk of corrosion" for both concrete and steel. Both the KkoB and KkuB soil types are a high risk for corroding concrete and a moderate risk of weakening steel. The RoarAt type, mainly in the Raritan River floodplain and the area of proposed development, is a high risk for weakening steel and a moderate risk for weakening concrete. These aspects should be considered by engineers when selecting materials for the proposed bridge and boardwalk.

The largest forested area in the study site is the Rutgers Ecological Preserve natural teaching area, north of Johnson Park in Piscataway Township. Based on the New Jersey State Development and Redevelopment Plan, the preserved area is designated a Critical Environmental Site (CES), and thus

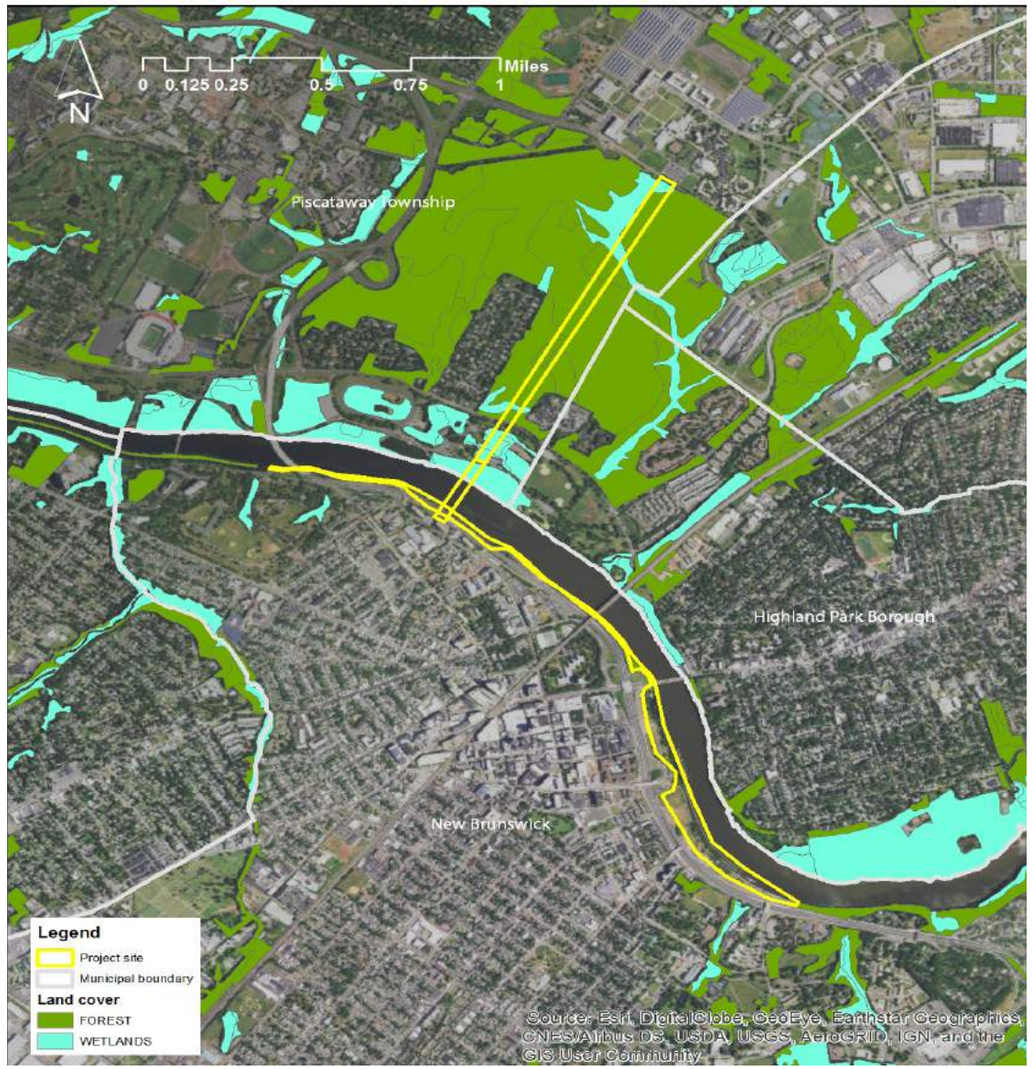


Figure 9: Map of land designated forest or wetland (by the NJDEP) surrounding the project area.

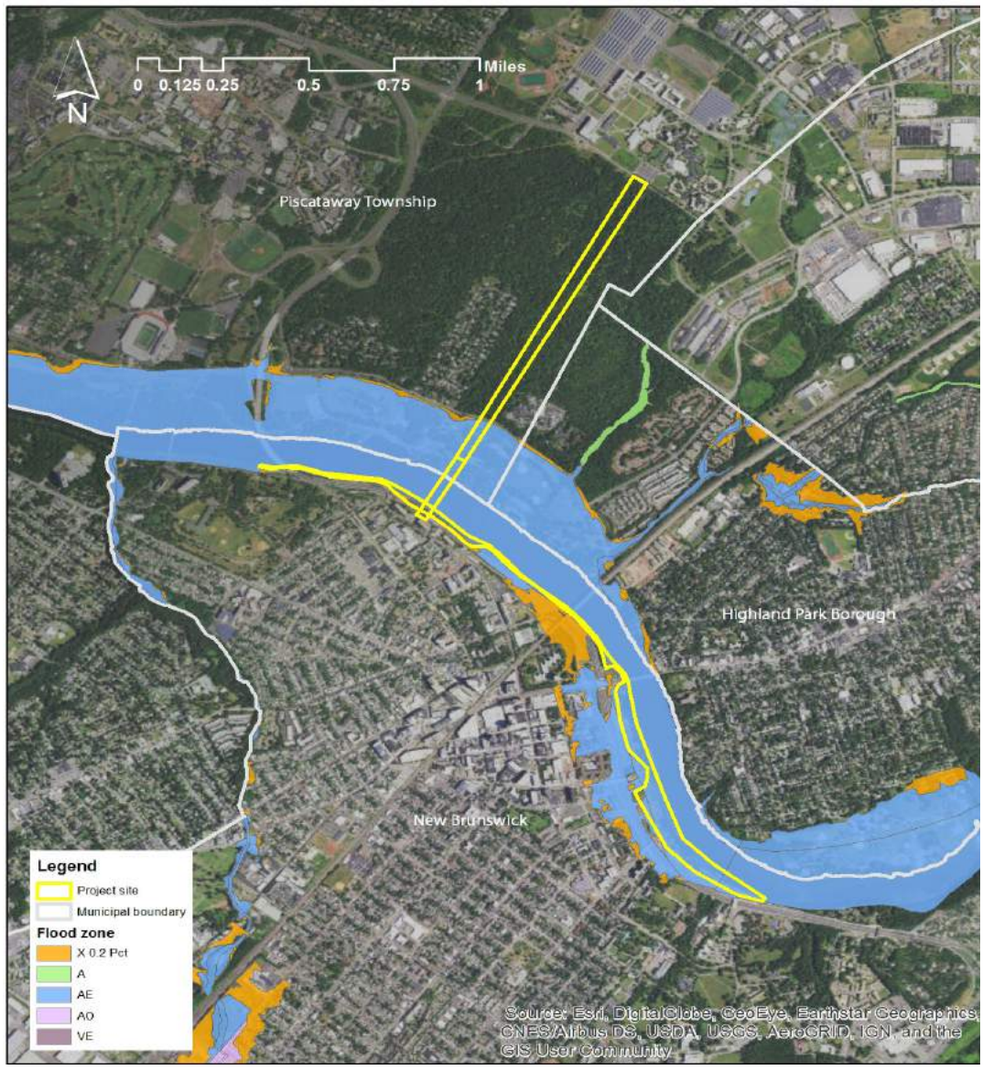


Figure 10: Map of soil typologies surrounding the project area.

requires careful consideration and evaluation prior to any development or redevelopment (Commission, 2001).

At the river's edge, the Raritan River water quality and its riparian buffer are generally clean and healthy, after a period of recovery from the legacy of industrial pollution. The river, freshwater wetlands, and forest of the study area provide habitats for various flora and fauna, including some species of special concern and endangered populations (see Table 1). The presence

Species Name	Behavior	Habitat	State Rank
Bald Eagle	Foraging	Riparian Corridor	State Endangered
Red-headed Woodpecker	Non-Breeding Sighting	Riparian Corridor And Wetlands	State Threatened
Great Blue Heron	Foraging	Riparian Corridor, Wetlands and Forest	Special Concern
Eastern Box Turtle	Occupied Habitat	Wetlands and Forest	Special Concern
Cliff Swallow	Breeding Sighting	Riparian Corridor	Special Concern

Table 1: Species of special concern and endangered populations.

of these species may trigger special environmental permits and seasonal construction restrictions.

The study area is home to diverse flora species, from maple and hickory trees to water lilies and cattails. Wetlands and forest are critical environmental sites in the study area. They provide habitat for threatened plants and animals. Future development in these areas should consider their sensitivity.

HEALTH & SAFETY| *Ensuring the welfare and protection of the space's visitors.*

Understanding circulation patterns, including road, pedestrian and bicycle networks, is essential to assessing the impacts of the projects proposed in the Rutgers 2030 Master Plan. The Rutgers University-New Brunswick campus is located near multiple major highways including: a national highway (U.S. Route 1), an interstate (I-95), two state highways (Route 18 and Route 27), densely distributed county roads, and municipal streets in New Brunswick and Piscataway (Figure 11). Of these, Route 18's John A. Lynch Senior Memorial Bridge, Route 27's Albany Street Bridge, and Landing Lane Bridge provide crossings over the Raritan River. The overall vehicular traffic volume across the Raritan River is over 10,000 a day according to a 2015 NJ Traffic Monitoring Program report (NJDOT, 2014).

In addition to roadways, New Brunswick hosts a variety of public transit opportunities. Most prominently, the Rutgers bus system operates throughout New Brunswick and Piscataway with the Brunsquick 1 and 2 serving local residents' and students' commutes. These buses (i.e., Route A, B, C, EE, F, H, LX, REXB, and REXL) ensure high quality daily travel on both sides of the Raritan River. Additionally, Middlesex County's MCAT Shuttles (M1 and M6), travel between downtown New Brunswick, East Brunswick and South Brunswick. NJ Transit buses (810, 811, 814, 815, and 818) connect New Brunswick to surrounding areas of Highland Park and Edison (City of New Brunswick, 2016).

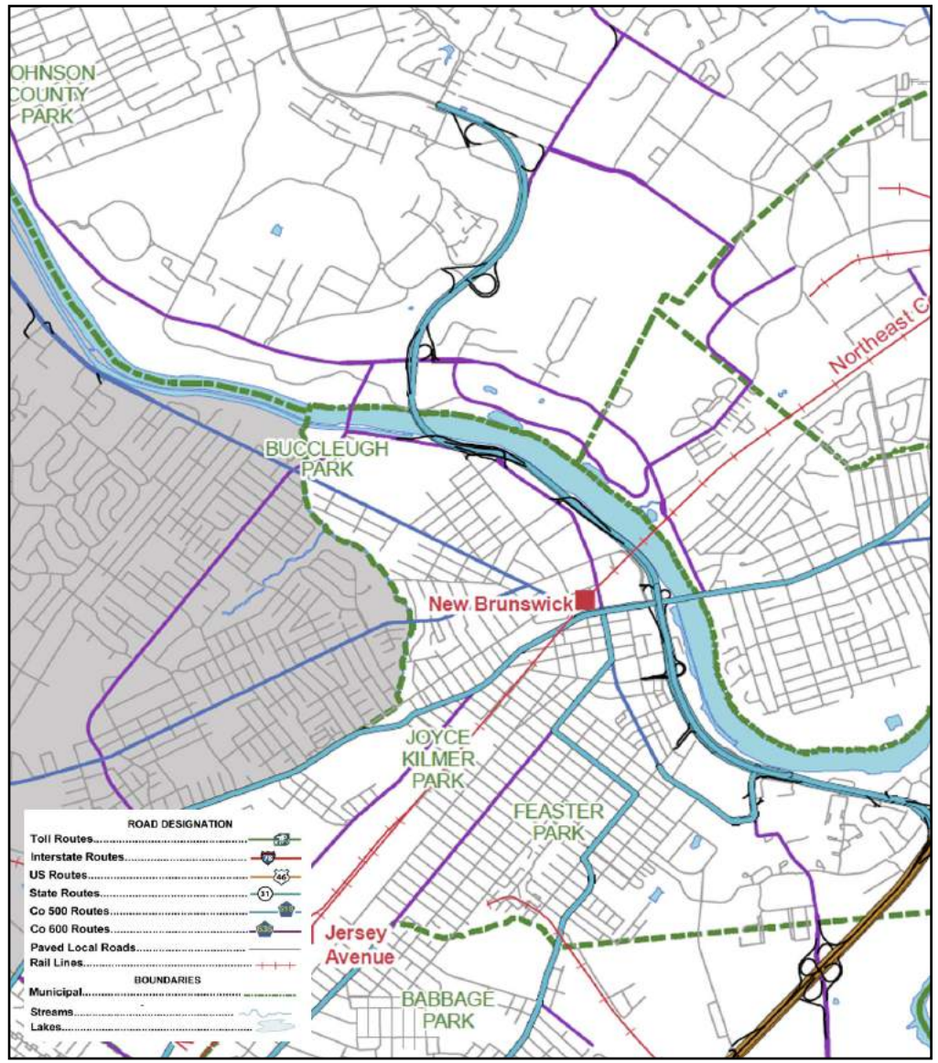


Figure 11: Road hierarchy of Rutgers University - New Brunswick region.

There are 27.6 miles of bike lanes in New Brunswick that fit into four categories: dedicated bike lanes (10.8 miles), sharrows (6.2 miles), shared pedestrian and bicycle paths (6.6 miles), and bicycle-friendly roadway (4 miles) (Figure 12). Aside from bike lanes, there are open space trails within the study area including the Delaware and Raritan Canal State Park towpath, a 0.75-mile trail in Boyd Park, a separated bicycle lane on the Route 10 Lynch Bridge, and the "trench" bike pathway from Route 18 to Route 27, all serving as connectors through the region.

Generally, the Rutgers University campuses and downtown New Brunswick offer high quality walkable spaces. Paved sidewalks, traffic lights, plants and benches combine to create a safe and comfortable walking environment. The connections between campuses and to the riverfront, however, are poor and unsafe. The path along the John A. Lynch Senior Memorial Bridge is narrow, immediately adjacent to heavy motorized traffic, with dangerous connections and crossings. Overall, improving the quality of the existing pedestrian network is vital to success of any project.

The parks near the Raritan River serve as destinations along the pedestrian network. In New Brunswick, Boyd Park is a favorable waterfront landscape. However, there are few access points to/from the urban areas due to Route 18. In contrast, Buccleuch Park, a park with no waterfront access, is more connected to New Brunswick's residential areas. Johnson Park has direct waterfront access and a bicycle-pedestrian network developed within it, but its connection to Rutgers campuses and student residential areas is limited.

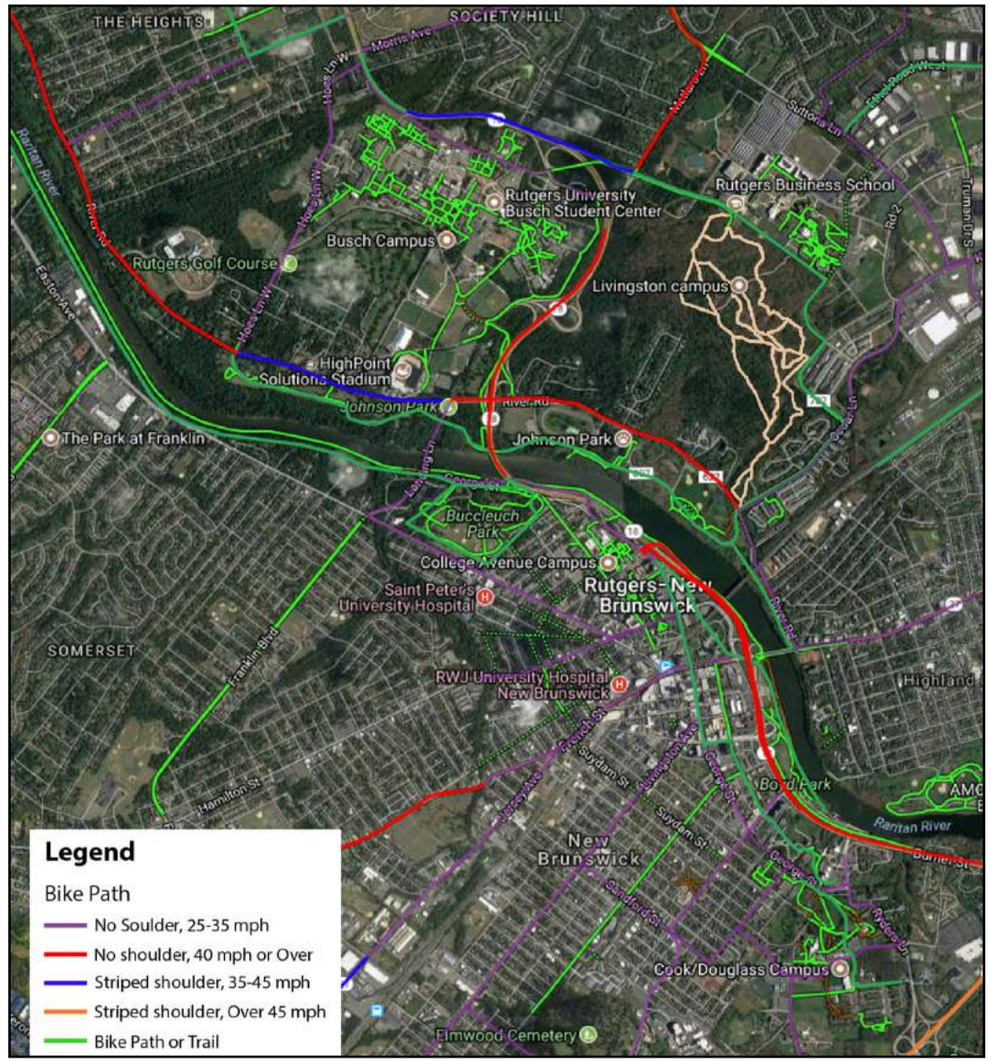


Figure 12: Bike network of Rutgers University - New Brunswick region.

CHAPTER 4:
FINDINGS & RECOMMENDATIONS

BOARDWALK

BOARDWALK

The Master Plan proposes a riverside boardwalk to further its core objectives of connectivity and health, wellness, & recreation. The plan emphasizes the historic focus around the Raritan and outlines the boardwalk's potential "to improve access to the river, connect riverfront parks and the [D&R Canal] to its north, [and] the Rutgers Boathouse at Boyd Park to the south" (Rutgers 2030, 2015: 331). This project envisions "...a safe and enjoyable pedestrian and bicycle access along the river, with areas of seating and activity" (Rutgers 2030, 2015: 159).

CAMPUS CONNECTIVITY - TRANSPORTATION

HEALTH, WELLNESS & RECREATION

Despite the potential for the project, several challenges hinder the current use of the Route 18 bikeway. Locally known as the "trench" by students of the university, the route includes dangerous entry points, a lack of maintenance, extensive trash and debris, and the perception of crime. Addressing the current issues of the area will lay a stable foundation for a future boardwalk along the Raritan. The studio team recommends that Rutgers University prioritize the boardwalk as an essential element of the Master Plan. To achieve a durable project with less cost and less red tape, the boardwalk should be integrated into the existing infrastructure (the Route 18 bikeway), and should be extended to link with the D&R Canal Trail. After exploring a variety of boardwalk types for their environmental, regulatory, and cost considerations, a floating boardwalk, such as that proposed in the RU2030 plan, is not recommended. Given the tidal nature of the waterway a stable anchored structure will be more resilient for the future. A higher embankment wall between Route 18 and the boardwalk is suggested to mitigate noise pollution from the highway making the walk more enjoyable for pedestrians. Like the bridge, the boardwalk can serve both as a means of transit and space for recreation/cultural programming to increase the space's use potential.

The following sections detail the research findings and recommendations for the boardwalk within the framework of access, environment, and health & safety.

BOARDWALK | ACCESS

The creation of a boardwalk could be a great asset to public access for both the City of New Brunswick and the University. However, to do so effectively, there are a number of access issues to consider: 1) understanding the shortcomings of existing access points, 2) considering the operating hours of existing park connections, and 3) acknowledging the adjacent roadway's affect of the quality of the space.

Physical access to the area is the keystone of this project's success. A major drawback to the existing walkway along the riverfront is the dangerous entry points along the highway (see Figure 8 in Existing conditions). In almost all cases, the existing entry points either cross major roadways or highway exit ramps, leaving them virtually unseen and unsafe. This severely limits access and creates an isolated and underutilized area. The location and elevation of these entrances, only adds to the complexity of the space. Figure 13 provides a diagram of the dramatic elevation change from Route 18 to the existing waterfront. Large staircases and intricate ramp systems, create a seemingly unapproachable space (Image 8) further cutting it off from pedestrians. In addition, the existing pathway offers no signage to provide visitors, unfamiliar with the area, navigation along the pathway. Without solutions at the entry, any project, despite its quality will be disconnected from its users.

The proposed boardwalk project can provide a key connection to existing

Image 8: A view of the staircase entry from New Street.

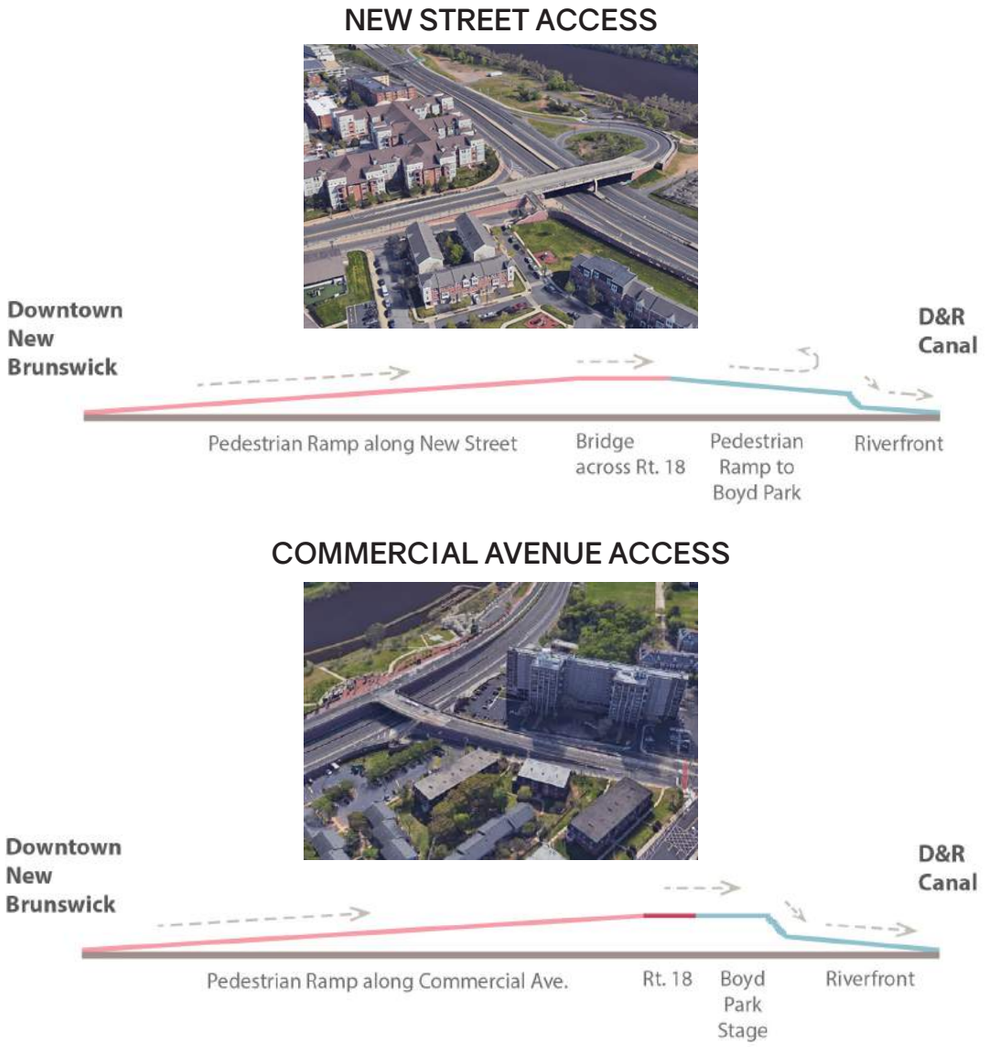


Figure 13: Diagrams of the elevation change of the existing access points along Memorial Parkway, New Brunswick.

trail networks and park spaces. Due to a water spillway at the end of the D&R State Park, the current walkway is disconnected from Boyd Park and the historic terminal locks of the canal. Adding this link would increase accessibility along the entire waterfront including the Rutgers boat house. However, when building new connections, it is important to acknowledge differing hours of operation for the surrounding parks.

Given the adjacency to major highways (i.e., Route 18 and Memorial Parkway), it is necessary to consider the implications of noise and air pollution on the pedestrian experience. Currently, there few areas along the walkway shielded from cars and trucks rushing by. Utilizing different elevations and construction techniques for the proposed boardwalk can enhance the pedestrian experience. Techniques may include, increased vegetative buffers, providing quiet spaces and places to sit and enjoy the waterfront, and improved infrastructure to enhance access to fishing. The path can also connect to The Landings where boaters could dock on their way to enjoying other area amenities.

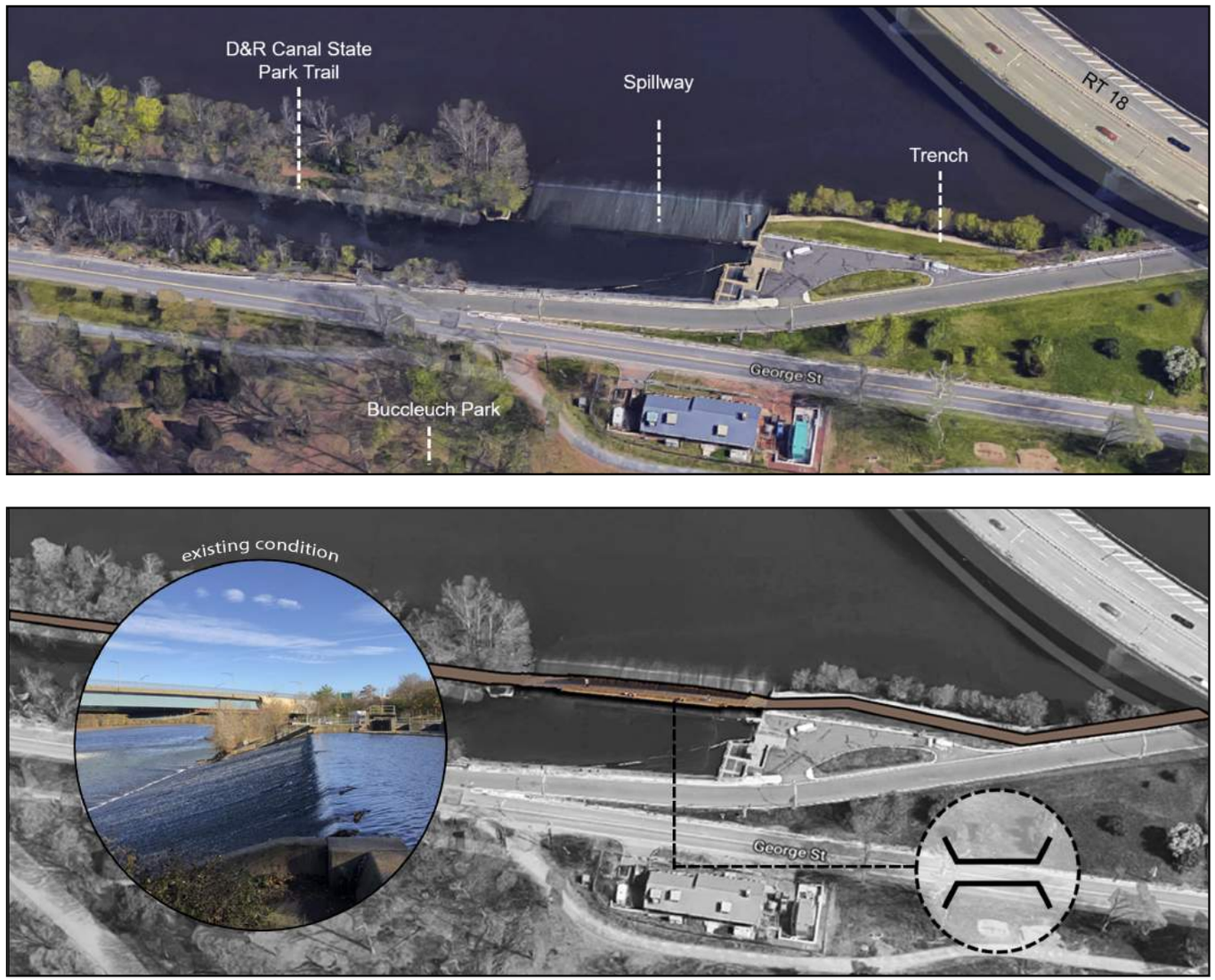


Figure 14: Rendering of the recommended bridge connecting D&R Canal State Park to the existing trench pathway.

ACCESS| *CONNECT OVER SPILLWAY*

Visitors to the D&R Canal State Park Trail cannot, unfortunately, continue walking southeast towards the trench due to the spillway and water intake located north of Buccleuch Park that interrupts the path. Reconnecting the path is an important opportunity for access to the proposed boardwalk.

Providing a bridge (that does not obstruct the day-to-day operations of the spillway) allows visitors to continue their journey an additional two miles into Boyd Park and the historic terminal locks at the end of the original canal (Figure 14).

This connection can take advantage of the setting, a cascade of water that provides therapeutic sounds and unique spatial qualities.

ACCESS| *CANTILEVERED CONSTRUCTION*

Providing wide areas along the path for diverse public activities is fundamental to attracting residents and visitors to the boardwalk.

To the project's advantage, there are several spots along the current trench that provide the spatial qualities for a comfortable environment. Those existing areas have enough vegetation or elevation change to buffer the chaos emitting from Route 18. These two qualities, elevation and vegetation, provide isolation from noise and city distractions. A cantilevered structure in specific areas of the boardwalk can help support a buffered edge when paired with increased vegetation or elevation change (Figure 15).

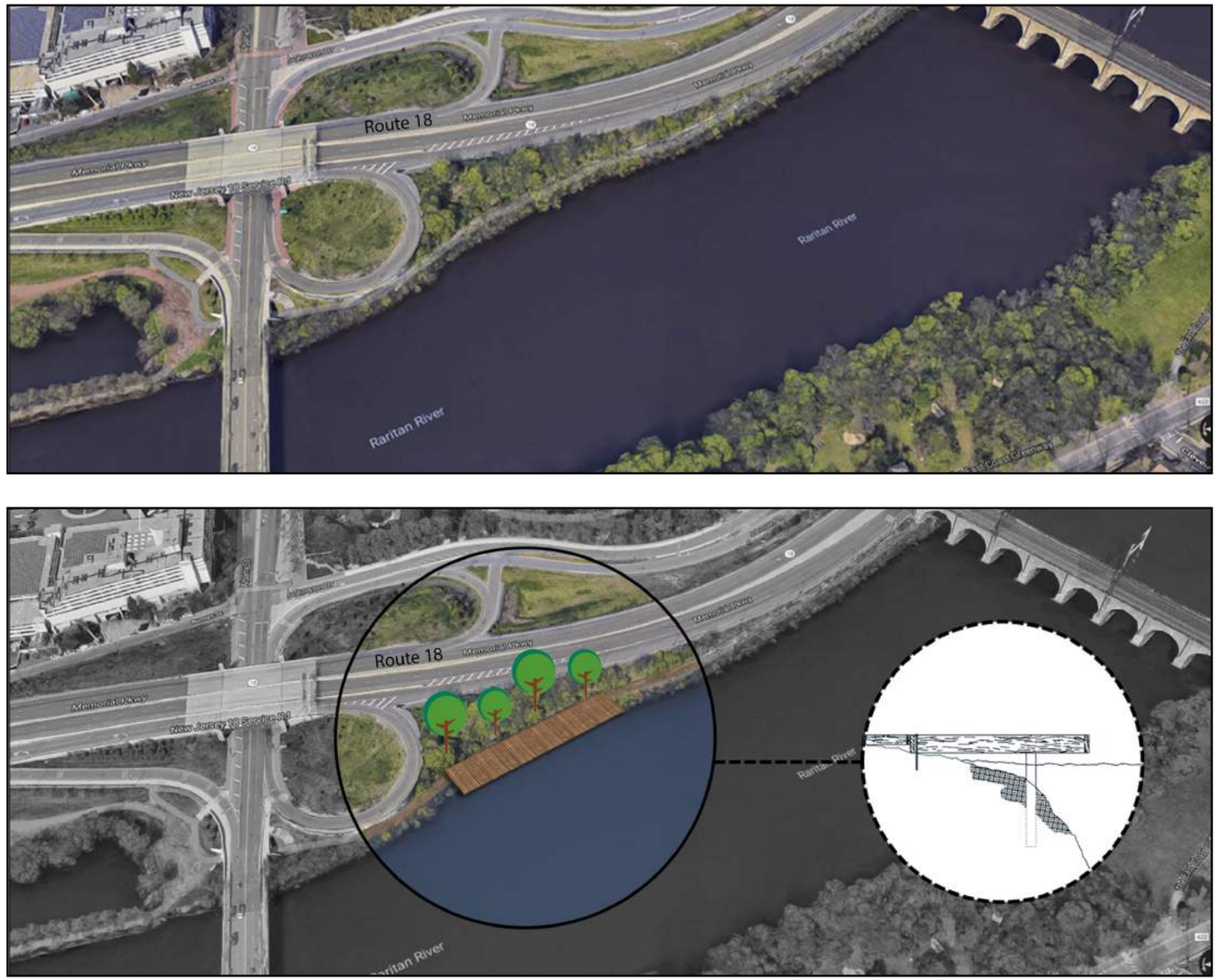


Figure 15: Rendering of the recommended cantilevered construction and noise-cancelling vegetative buffer.

BOARDWALK | ENVIRONMENT

In an age of climate change, it is important to consider key environmental effects of development along the river's edge. As mentioned in Chapter 2 (see *Existing Conditions*), New Brunswick is host to a combination of wetlands, forests, and patches of natural habitats. Land types and proximity to tidal waters play a key role in design consideration for a boardwalk along the Raritan River.

Based on flood zones designated by the Federal Emergency Management Agency (FEMA) (Figure 16), the entire area of the proposed boardwalk (shown in yellow along the river) lies in the 100-year flood zone. Previously, this designation indicated the potential for flooding once every 100 years. However, over the last ten years, increasing storm intensity and hurricane frequencies have caused a variety of damage along the riverfront and its neighboring municipalities. In 2011, Hurricane Irene hit New Jersey causing intense flooding throughout most of New Brunswick, Piscataway, and Highland Park (Image 9). In a report published by the USGS in the aftermath of Hurricane Irene, the Raritan River at its New Brunswick section hit record high peak stream flows leaving Route 18 entirely under water (Watson, 2014). Similarly, Image 10 shows flooding on May 1, 2014 during a typical spring rain with no hurricane classification.

Increasing inundation in these areas requires the consideration of flood

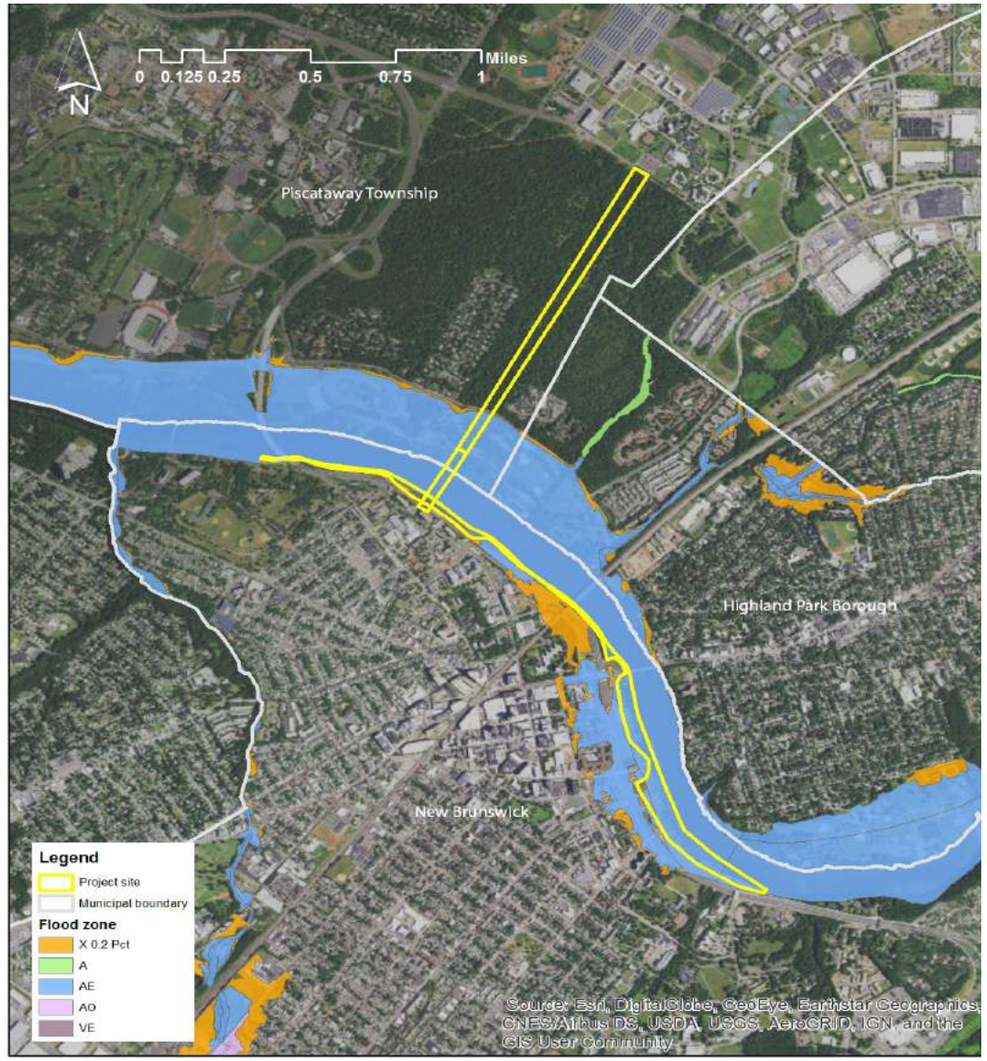


Figure 16: Map of flood zones as designated by FEMA.

Image 9: Photo of Route 18 following Hurricane Irene in 2011.

Image 10: Photo of a spring storm on May 1, 2014 by Sara Malone.

resilience features for the proposed boardwalk. The boardwalk should resist future storms, and be designed to support long-term sustainability.

In addition to resiliency, the health of the riparian edge is another environmental concern. Since the industrial revolution, the local community has made great strides in improving the water and edge quality of the Raritan River. As a result, it has become habitat for diverse plants and animals including, the great blue heron and bald eagle. Wild creatures are indicators to show how attractive the riverside is to visitors providing a sense of health and peace to the area. Unfortunately, if not considered, new development can disrupt nesting areas or other habitat assets for these animals. Any development should be careful of these concerns, protect precious natural resource, and retain citizens' interest.

Moreover, considering that construction of a boardwalk may occur on both the river edge and in the water body, construction debris may bring new pollutant problems for this area. The new construction may also affect river conditions downstream.

Figure 17: Rendering from Yanweizhou Park in Jinua China depicting an example of flood resilient design.

ENVIRONMENT | *FLOOD-RESILIENT*

Around the world more public spaces are designed to be flood resilient. The Yanweizhou Park in Jinua City, China is an example of a recreational area that can be dramatically flooded. At Yanweizhou Park, the terrain and plantings are designed to absorb the floodwater allowing it to recede after the storm (Figure 17) .

While some areas can flood, other infrastructure was raised to prevent flooding during storms. For example, the bridge was elevated above the 200-year floodplain, while ramps connecting the riparian wetland park can be submerged during the 20-year primary access to the area remains accessible at all times.

The boardwalk design should incorporate features that allow flooding, while also considering issues of access during large storms like Hurricane Irene.

ENVIRONMENT| *SMALL FOOTPRINT*

In order to minimize impacts to the natural environment, the boardwalk should be designed to have a relatively small footprint. In Figure 18, a student design created by Daniel (Zhicheng) Xu, an undergraduate student from Purdue University gives an example of a boardwalk that has a minimal share of the total surface of the intervention, allowing the softscape to maintain existing habitats and natural function. If the boardwalk were to be built with a much larger footprint, there is risk of disturbing native flora and fauna while also increasing impervious surfaces eliminating the possibility for water infiltration, among other negative impact.

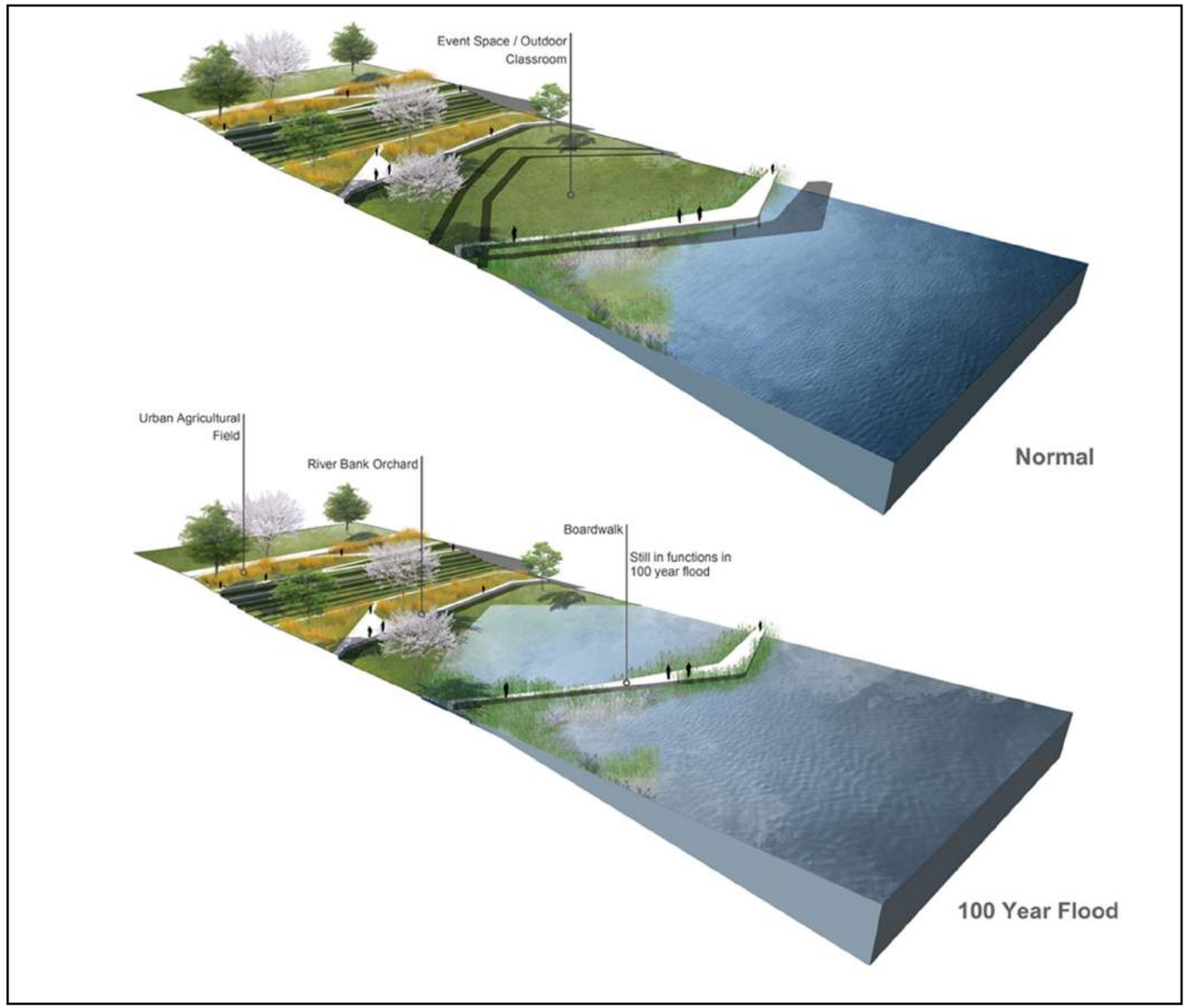


Figure 18: Rendering from a student design project by Daniel (Zhicheng) Xu showing a small footprint intervention.

BOARDWALK HEALTH & SAFETY

The proposed boardwalk sparks a number of concerns related to health and safety. These concerns range from the perception of crime, risks associated with water, and strategies for homeless encampments.

The current condition of the existing walkway is poor and uninviting. With little maintenance over the last several years, the area is taken over by large areas of weed overgrowth, burnt out lighting, broken benches, and unsightly graffiti (Image 11). As a result, the area evokes a perception of crime making users feel unsafe and unwilling to visit the space. According to a study done by the World Health Organization Kobe Center for Health Development, an increased perception of crime can inhibit physical activity, deteriorating overall human health and wellness (Boulange, 2011). As proven by the Middlesex County Community Health Plan, adults report feeling unhealthy, physically and mentally, up to three days per month. In addition, 25% of people over 20 years or older report being "physically inactive" (HRIA, 2016). Although this area is not entirely to blame, the proposed boardwalk provides an opportunity to improve current local health statistics by offering the appropriate environment to evoke the feeling of a safe and usable space.

In addition to ameliorating the perception of crime, the proposed boardwalk project will increase the number of visitors to the waterfront. Although a perceived asset to the project, it is important to consider that increases in park population can intensify water associated risks (i.e., drownings and pollutant exposure). Earlier last month, an online news website published an article about an 11-year old boy who drowned in the Raritan River in 2012 (Munoz, 2017). An increase in visitors requires additional signage of where, if anywhere, swimming is permitted.

Image 11: Existing areas with broken down benches and weed overgrowth from studio site visit on September 24, 2017.

In addition to drowning risks, the New Jersey Department of Environmental Protection (NJDEP) has published informative signage regarding health related risks associated with the consumption of fish from contaminated waterways. Given the current population of recreational fishing on the

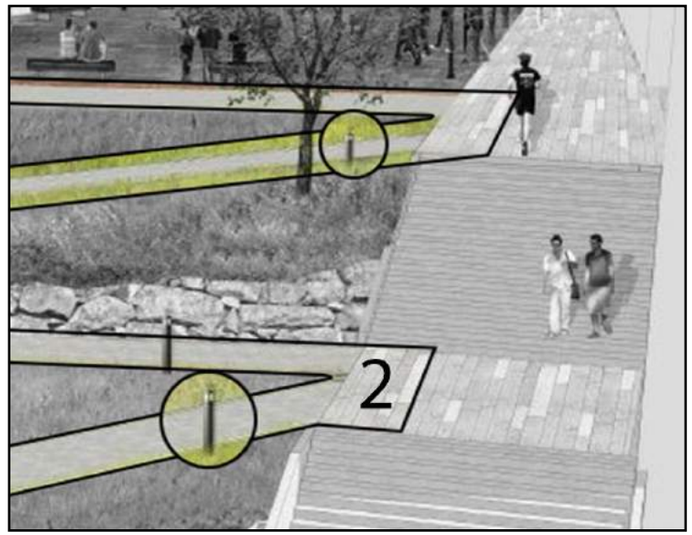
Raritan River, informative signage that notifies visitors of these risks is recommended. Table 2 shows an example of this educational signage published by the NJDEP.

RARITAN BAY COMPLEX Includes the Raritan Bay, tidal Raritan River (to Rte. 1 bridge) and the tidal portions of all tributaries. *See below for White Perch and White Catfish for the Raritan River and South River.			
SPECIES		GENERAL POPULATION EAT NO MORE THAN	HIGH-RISK INDIVIDUAL EAT NO MORE THAN
	American Lobster	One meal per week Do not eat green gland (hepatopancreas) Discard cooking liquid	
	Weakfish	One meal per month	Do not eat
	Striped Bass		
	Winter Flounder		One meal per month
	Porgy		
	American Eel	One meal per year	Do not eat
	Summer Flounder	One meal per week	
	White Perch (See below South River)	One meal per year	Do not eat
	Redbreast Sunfish	No restrictions	One meal per month
	Channel Catfish	One meal per month	Do not eat
	Blue Crab	One meal of 7 crabs per month Do not eat green gland (hepatopancreas); Discard cooking liquid	
RARITAN RIVER - SOUTH RIVER (tidal portion) upstream of Route 35 Bridge and tidal South River			
SPECIES		GENERAL POPULATION EAT NO MORE THAN	HIGH-RISK INDIVIDUAL EAT NO MORE THAN
	White Catfish	Four meals per year	Do not eat
	White Perch		

Table 2: NJDEP Statewide estuarine and marine waters advisory, 2017.

For years, *New Brunswick Today* has written articles regarding a growing homeless population in the city. Evidence shows this is a concern throughout the city as well as on the site of the proposed project (Image 12). As new projects develop, strategies for homeless encampments must be addressed to relocate these populations to safer areas throughout the city. Currently, New Brunswick has a number of social services in their downtown area and community groups like Elijah's Promise and other faith-based organizations that are committed to providing resources and services to the homeless. Partnering with these groups throughout the process can offer opportunities for managing these concerns.

Image 12: Homeless encampments under Route 27 in New Brunswick, New Jersey.



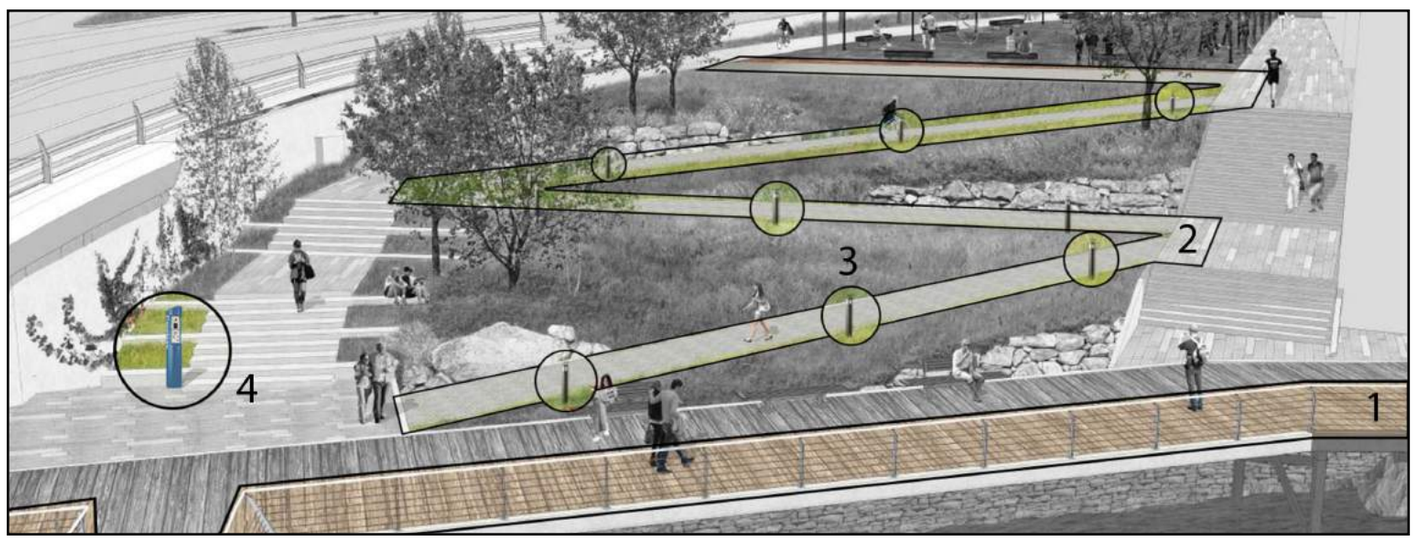


Figure 19 (above and right): Rendering of potential safety measures for the proposed boardwalk area.

HEALTH & SAFETY| *SAFE DESIGN*

This waterfront promenade highlights the various ways that safety measures can be manifested in physical forms.

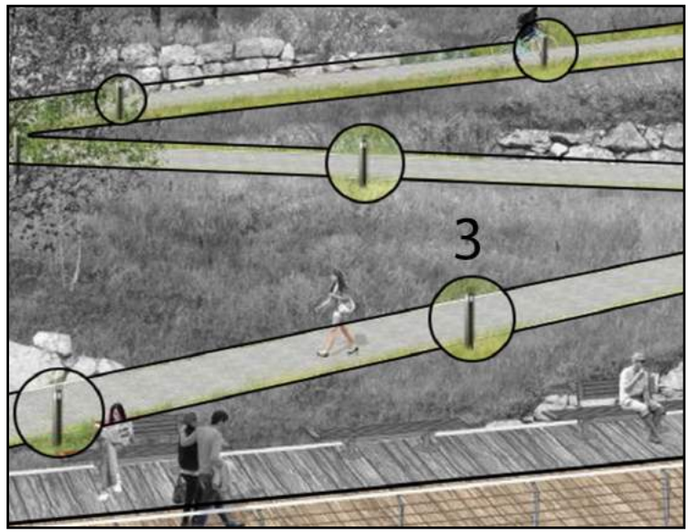
(1) Railings in the boardwalk will be required by code due to the elevation difference between the walking surface and the water. Railings can add to the overall aesthetics of the boardwalk and should be seen as an opportunity to blend with the natural landscape, for which case tensioned cable strand railings can provide a transparent look.

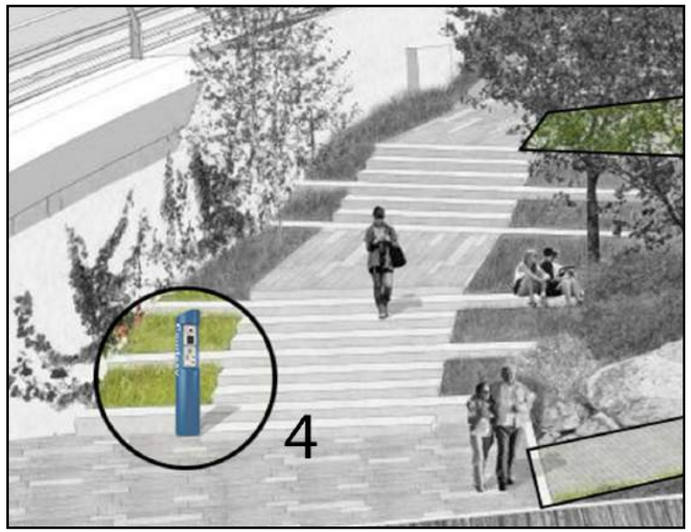
(2) ADA compliant ramps should be included in the design. Ramps should not be extremely long, but have landings along the way. Ramps allow for wheelchair users and people with mobility problems to navigate the space without major issues.

(3) Lighting is important in all aspects of public design. It not only increases safety, but aids in geographic orientation; can help highlight

the identity and history of an area; and create a sense of drama. However, multiple studies conclude that an abundance of security lighting, in addition to being unpleasant to the eyes, is actually a poor strategy for increasing visibility and lowering crime rates. Security lights can actually aid criminals by creating a glare, which encourages pedestrians to look away and creates deep shadows in which criminals can hide. For that reason, it is recommended that lighting be designed with a pedestrian scale in mind. Lower, path-oriented fixtures with adjusted brightness that do not create excessive glare for pedestrians and can add a sense of magic to the public space.

(4) Emergency call stations, which are very common in university campuses, help draw attention to a distressed person and deter crime. These devices trigger an immediate response from a command center, but cannot replace active patrols in these spaces.





MULTI-MODAL BRIDGE

MULTI-MODAL BRIDGE

The Rutgers 2030 Master Plan proposes a multi-modal bridge over the Raritan River to "connect College Avenue to the municipal and county park system along the riverbanks, offering improved access to running paths, play fields, and other recreational facilities" (Rutgers 2030). The proposal provides a connection from Deiner Park (see *Introduction* for reference) to Johnson Park in Piscataway Township with the potential to activate recreational spaces in the surrounding area. The bridge also aims to connect campuses by developing a walkway through the Rutgers Ecological Preserve. The following section synthesizes the findings and recommendations for the multi-modal bridge and proposed walkway through the Ecological Preserve.

Although the proposed bridge seeks to enhance health, wellness, and recreation while strengthening connections on campus, it is recommended that other connections (i.e. boardwalk or existing infrastructure) take priority. By first targeting other parts of the Rutgers 2030 Master Plan, such as the boardwalk development (see *Boardwalk*) and connection to the D&R Canal State Park, the University could bring foot traffic back to the area and encourage use of the space before investing in new infrastructure. Bringing attention to the river's edge will make a stronger case for an additional river crossing, as existing bicycle and pedestrian infrastructure across the river exists though is severely limited. A completed boardwalk will not only improve the river edge, but make the campus connection even more appealing to students.

Existing bicycle and pedestrian infrastructure on Route 27 and the Lynch Memorial Bridge has the ability to connect students and residents to the open spaces in the area. With minor improvements, these connections could be more visible and accessible for multi-modal travel.

Conversely, the multi-modal bridge provides an opportunity to extend the open space network across the river. It can become a place to enjoy the views of the river, birdwatch, and cheer on the Rutgers Crew Team during their seasonal races. A bridge can be an icon for Rutgers University-New Brunswick, providing a space for community events and recreation and an attraction for out-of-town visitors. However, to serve exclusively as a transportation-oriented structure would be a disservice to the community and repetition of what already exists.

The Rutgers 2030 plan states that campus open space and natural areas are vital and should be preserved for recreation and wellness. The Rutgers Ecological Preserve is one of the few natural areas on campus; it is host to a variety of critical plant habitats and living laboratory study projects. As a result, its current use and condition presents many obstacles for a safe, accessible commuter path. For these reasons, the studio team recommends that no development occur within the Preserve itself. Alternatively, the enhancement of existing infrastructure can provide similar campus connections without the environmental impact. The following section details the findings and recommendations for the multi-modal bridge and Rutgers Ecological Preserve connection.

ACCESS

When considering access for the bridge and Rutgers Ecological Preserve pathway, there are both cultural and physical boundaries to be considered. The proposed multi-modal bridge could enhance access for students and residents to Johnson Park, the proposed boardwalk project, and Boyd Park creating a network of recreational space as an asset for, both, the student body and local community. Conversely, as a commuter route, the bridge project is not a suitable replacement for other necessary improvements to the campus transportation network.

A network analysis, which assumes an estimated length of the bridge, found that it would take a pedestrian 20 minutes to walk from the College Avenue Student Center to the landing site in Johnson Park while walking at an average pace of 3 mph. As shown in Figure 20, the yellow path is just a fraction of what it would take to commute, on foot, to the classrooms on Livingston Campus.

To continue this analysis, topography of the route options were compared including the proposed bridge in each option. Figure 21 shows a diagram for each route from the College Avenue to Livingston campus including the bridge as the first piece. The first image shows the elevation change for the proposed route from Diener Park to Livingston by way of the Rutgers Ecological Preserve. The gray line indicates the drastic topographic fluctuation over the 1.54 mile distance. Although not significant in distance,

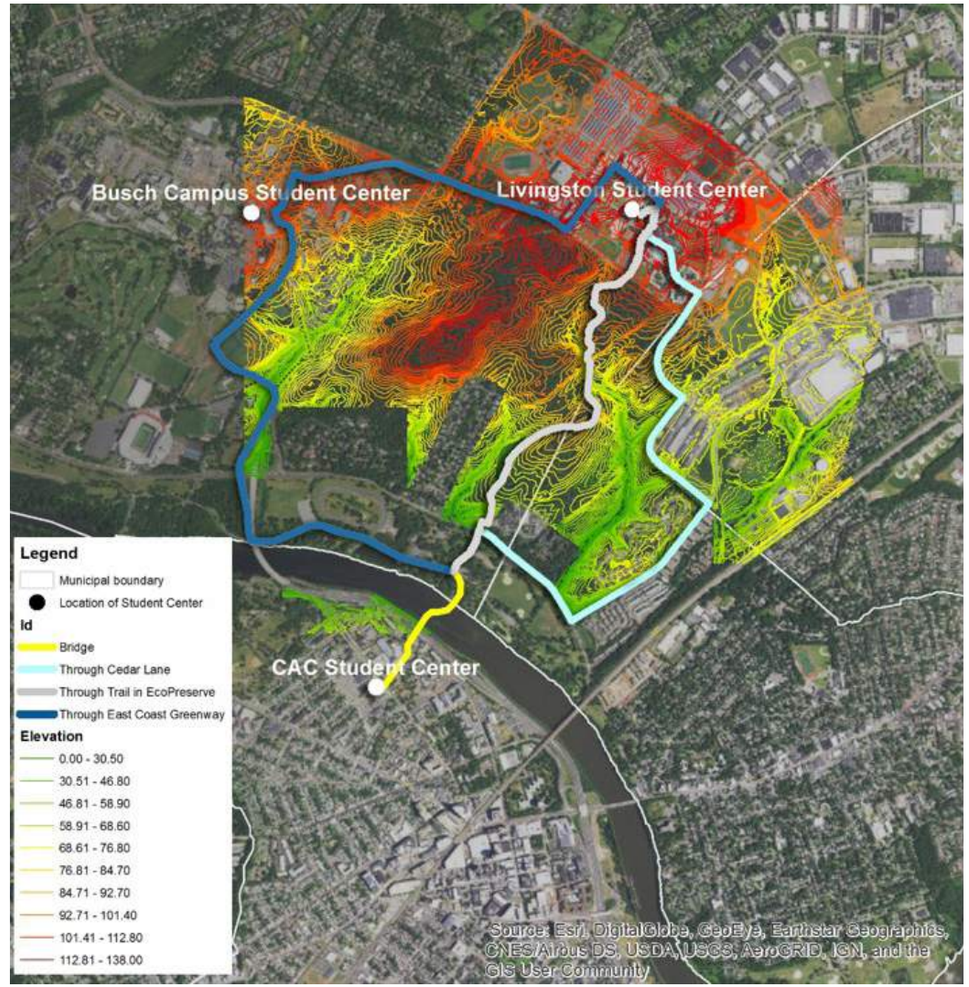


Figure 20: Map of soil typologies surrounding the project area.

the route includes slopes of nearly 10% in some areas, proving strenuous for both pedestrian and bicycle travelers. The bottom two images show elevation changes for the bridge connecting to existing bicycle/pedestrian routes in the area. Although longer in distance, it is clear that the existing routes are more feasible to bicycle and walk as it relates to topography.

To provide an asset to the community, the bridge must serve as more than a commuter route for students. Adding amenity nodes to the bridge could expose the user to a variety of Rutgers and community programming. Similarly, it is important to consider how the bridge is branded and portrayed to the local community as some stakeholders noted that this will feel like a "Rutgers exclusive" project. Bilingual signage, a variety of programming, and wayfinding to the bridge from the city will encourage diversity in the space.

PARK	DAYS OPEN	HOURS OF OPERATION
Boyd Park	Mon-Sun	1 hour after sunrise to 1 hour after dusk
Buccleuch Park	Mon-Sun	1 hour after sunrise to 1 hour after dusk
Johnson Park	Mon-Sun	sunrise to sunset
Deiner Park	Mon-Sun	1 hour after sunrise to 1 hour after dusk
Rutgers Ecological Preserve	Mon-Sun	8AM-5PM

Table 3: Surrounding parks (local and county-owned) and hours of operation, respectively.

Additionally, the project should acknowledge the hours of operation for the surrounding parks when considering its functionality. For instance, this may be problematic for late-night classes or evening events. Table 3 provides a summary of the hours of operation for surrounding parks to ensure they are compatible.

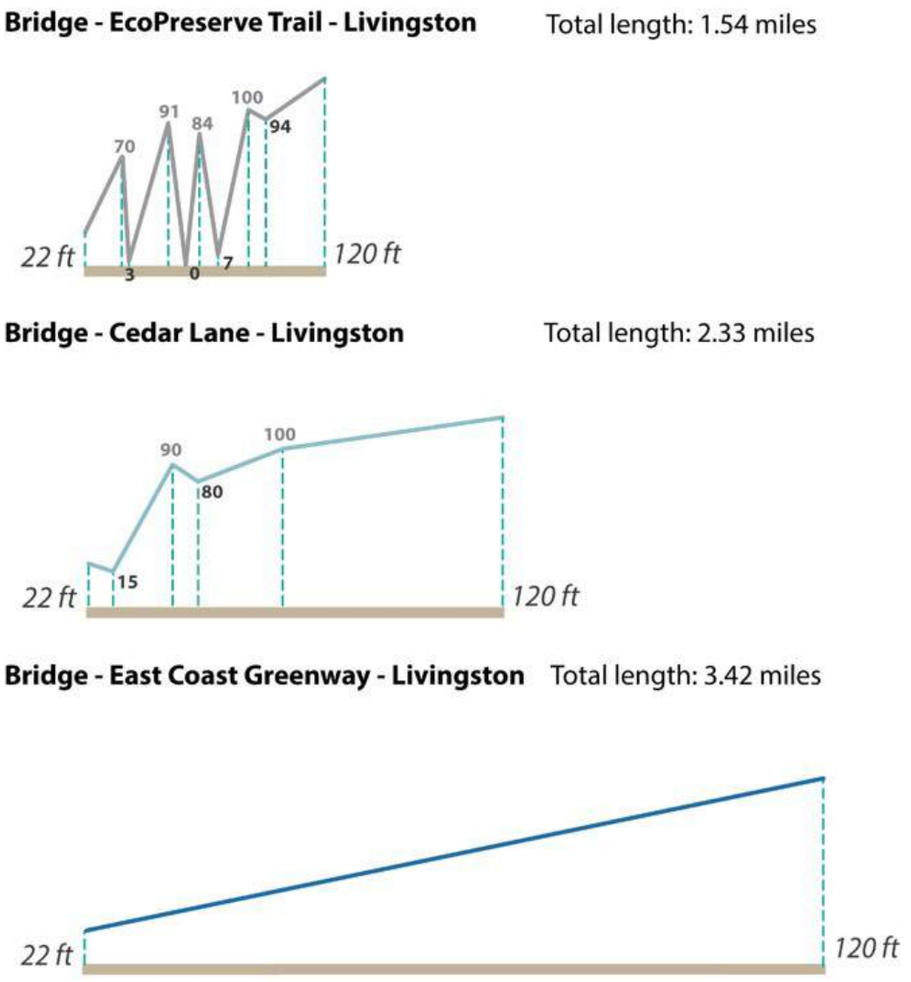


Figure 21: Elevation diagrams of different routes connecting College Avenue to Livingston Campus.

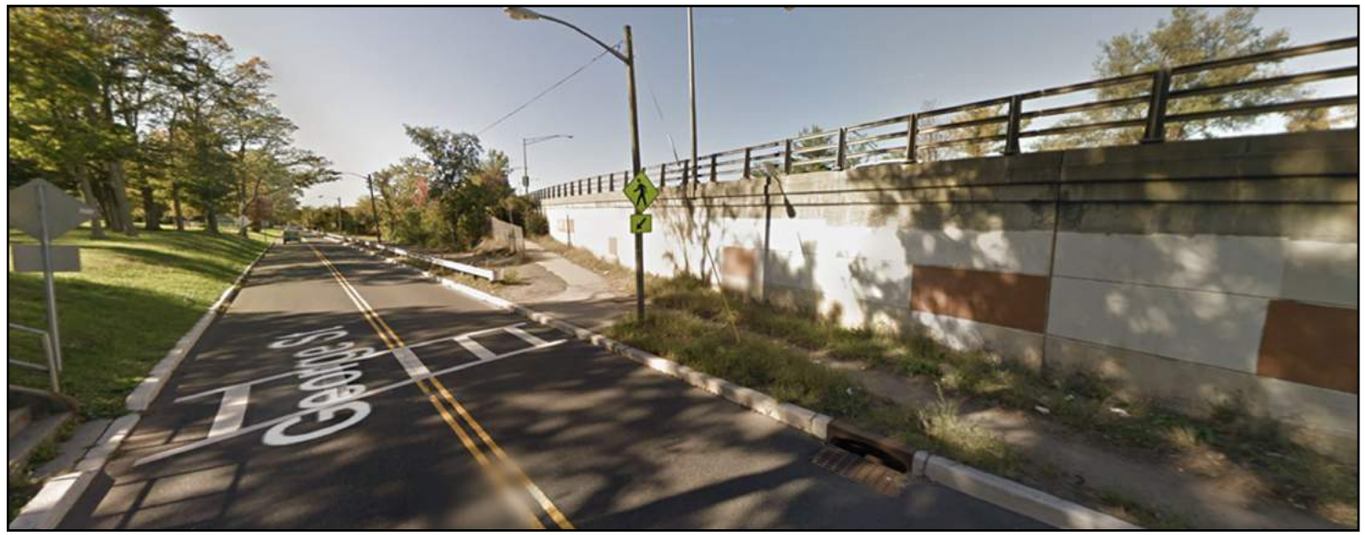


Image 13: Existing crossing at Buccleuch Park along George Street.

Figure 22: Rendering of existing infrastructure enhancement through mural painting and wayfinding.

ACCESS | *ENHANCE EXISTING INFRASTRUCTURE*

Bicyclists and pedestrians can travel between Rutgers University-New Brunswick campuses using existing infrastructure. Cedar Lane near River Road provides a connection from College Avenue Campus to Livingston Campus by Route 27. Additionally, the John A. Lynch Sr. Memorial Bridge provides a connection from the College Avenue Campus to Busch. Each campus can connect to the Cook/Douglas campus via a bicycle lane on Nielson Street or the sidewalk on George Street. Unfortunately, many students are unaware of the these simple routes, and opt for the bus instead.

Small interventions such as wayfinding, mural painting (Figure 22), and attractive landscaping can draw attention to existing infrastructure helping students find alternative routes and encourage more active travel between campuses.

ACCESS| *AMENITY NODES*

The proposed bridge should be a destination rather than a transportation route. Creating a space over a body of water allows for a closer connection to the natural environment and visitors to take in beautiful city views. Amenity nodes create space where people want to stay. Figure 23 (top) highlights how residual space between paths can be used for various programming (i.e. concerts, recreational opportunities, educational events, etc.). This space attracts visitors and provides opportunity for local partnership for events. Figure 23 (bottom) also highlights areas to rest while crossing the bridge. These areas include softscapes and benches for reading, picnicking and other means of enjoying the space. It is recommended that the bridge include areas for viewing wildlife and other scenery.

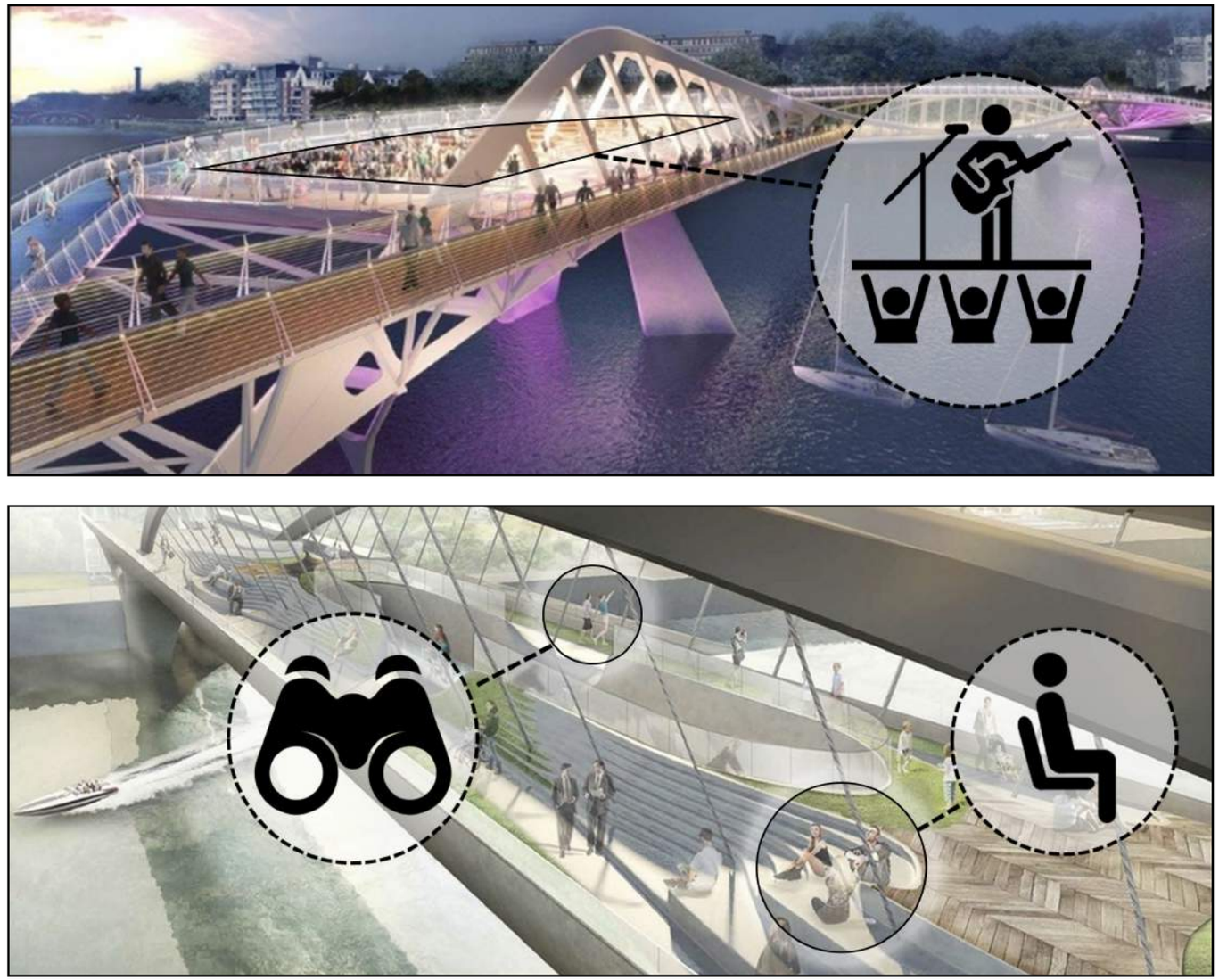


Figure 23: Renderings of amenity recommendations for the proposed multi-modal bridge across the Raritan River.

ACCESS| *BICYCLE AMENITIES*

To further enhance existing infrastructure, it is recommended that designers include bicycle amenities along existing routes to and from Livingston and Busch Campus.

The intersection of Cedar Lane and River Road can provide easy access to the Livingston Campus while avoiding disturbance of the Rutgers Ecological Preserve. This location, shown in Figure 24, is ideal for a bicycle share station for students to complete their journey from the proposed bridge to campus.

Adding other amenities such as benches, trash cans, call boxes, and other wayfinding elements brings awareness to the existing route to Livingston Campus following the bridge construction. Even before the bridge is completed, the Route 27 bridge connection to River Road, currently underutilized, could be highlighted as a means of traveling to Livingston.

Image 14: Existing crossing at Cedar Lane and River Road.

Figure 24: Rendering of bike share and service station at Cedar Lane and River Road in Piscataway, New Jersey.

MULTI-MODAL BRIDGE | ENVIRONMENT

The Rutgers 2030 Master Plan proposes to build a bridge within a floodplain on the tidal Raritan River. From an environmental perspective, this project requires a number of considerations related to resiliency, wetland function, and ecological habitat.

According to FEMA and NJDEP, the proposed landing site of the bridge in Johnson Park is located in a 100-year flood zone and freshwater wetlands area. As seen in Image 15, heavy precipitation events regularly flood this area. According to stakeholders, these floods often leave significant debris for park maintenance to remove afterwards. Considering that it is likely this landing will be regularly underwater, it is important for the bridge to be designed with flood resiliency in mind, including provisions for long-term maintenance, especially after storm events.

Image 15: Johnson Park at Landing Lane in Piscataway, New Jersey on May 1, 2014, provided by NJ Weather & Climate.

Moreover, as a freshwater wetland, Johnson Park is an important habitat for various species of concern such as great blue heron, eastern box turtle, and red-headed woodpecker (NJDEP, 2018). It is important to consider how the bridge construction will disturb these species or negatively impact on their habitat.

Additionally, because of its sensitive location, the bridge requires compliance with all associated wetlands and species regulations (see *Regulations* for details). In addition, the area may be subject to seasonal restrictions on building and will require an Environmental Impact Statement (EIS) if federal funding is utilized.

From an environmental perspective, the risks associated with the bridge far out weigh its function. As previously mentioned, if used solely as a transportation method, it is redundant and unnecessary due to existing transportation routes across the river. However, if built, it is recommended that the bridge utilize low-impact architectural design to minimize the environmental impact both on associated species and the river landscape itself.

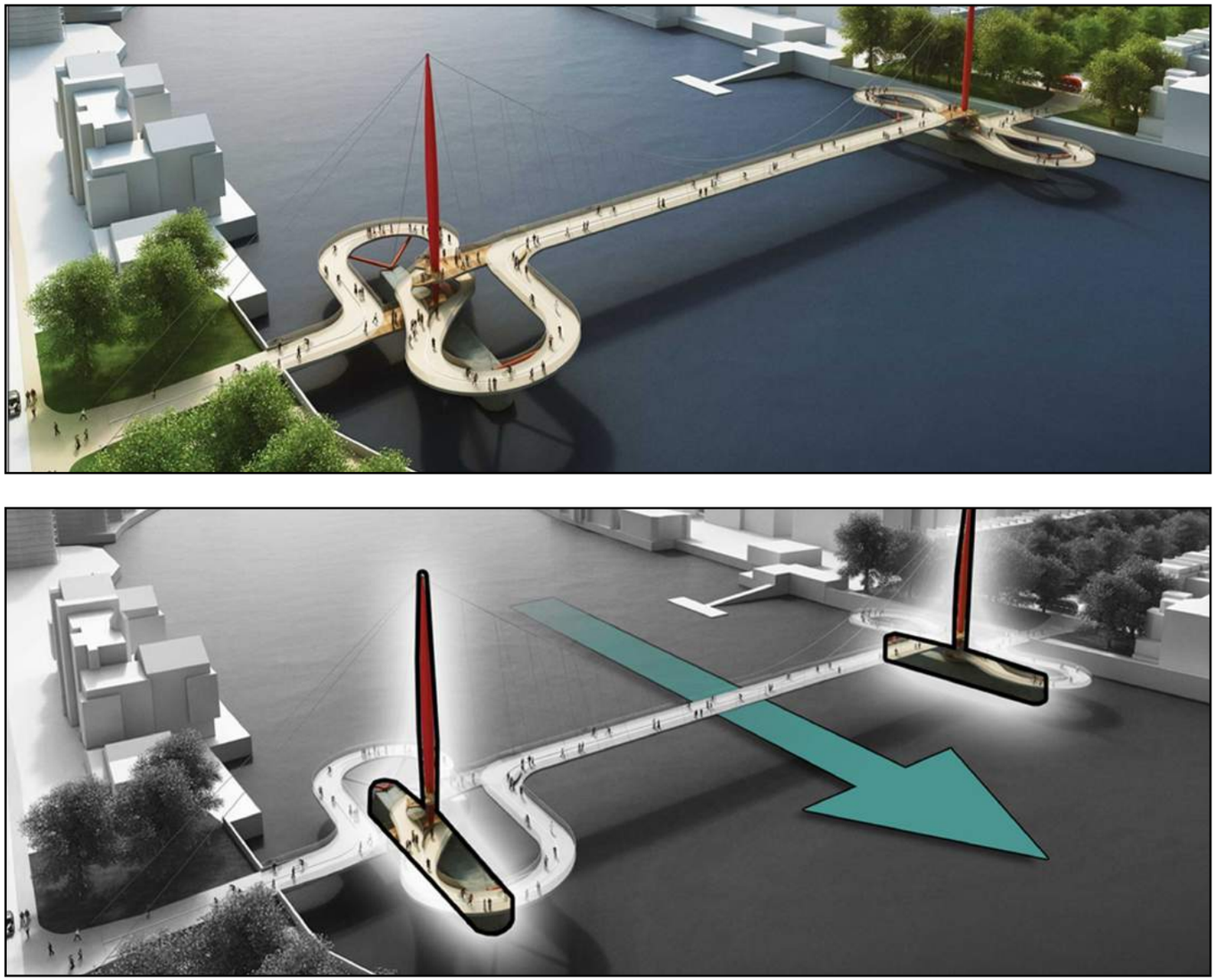


Figure 25: Rendering of options for architectural elements with limited environmental impact for the proposed bridge.

ENVIRONMENT|

Minimize Number of Pylons

Although this report does not provide engineering solutions, and the multi-modal bridge can take any shape or form. It is recommended that the structural solution of the bridge minimizes the number of pylons, or piers, used to support the bridge. This reduces the environmental impact and limits the collection of debris in downstream areas.

Furthermore, this type of thoughtful design must sustain continual impacts from ice and other large items flowing in the river. Having fewer support structures encourages a design with more clearance from the water, necessary for boats that require at least eight feet of clearance above the high tide. Due to the aniticipation of rising tides, future sea level rise projections should be considered in design plans (Arcadis, 2016).

MULTI-MODAL BRIDGE | HEALTH & SAFETY

The proposed bridge project presents a number of concerns related to health and safety. These range from the perception of crime, exposure to weather, and concerns related to mental health.

Currently, the location of the proposed bridge is dark and unwelcoming to visitors. According to the local park operating hours shown earlier in Table 3, both Johnson Park and Deiner Park close at dusk. This leaves both proposed landing areas of the bridge dark and unsafe for single travelers after hours. Adjusting park hours, increasing lighting, and accommodating emergency vehicles will provide a safe space for travelers when commuting from work or class late in the evenings.

In addition to park operations and lighting, the proposal offers the opportunity for multi-modal transportation between two distinct areas of the university. According to the Middlesex Greenway Access Plan Health Impact Assessment, multi-modal transportation puts users at risk of collision by shear proximity and human error. As a result, this bridge and trail network requires the appropriate safety measures to differentiate lanes for various transportation methods.

Additionally, the proposed trail envisioned to extend from the bridge through the Rutgers University Ecological Preserve, will require significant improvements to establish a safe space for users. Considering the health and safety concerns associated with a trail through the Rutgers Ecological Preserve (i.e., walking in the dark, emergency access, etc.), a full assessment of the trail must compare the requirements of a functional multi-modal pathway with the mission of the Preserve. In other words, assuming the path would be open beyond dusk and provide multi-modal access similar to the bridge, it would require paved material and lighting. Currently, the area is used as a living laboratory; students and researchers require limited disturbance for effective experimentation. Engaging the existing communities and understanding the cost benefit of these implications is necessary for further development.

Beyond the physical health and safety of users, mental health is a significant concern for the proposed bridge. According to the New Jersey Youth Suicide Report published in 2016, “falling”, defined as jumping or falling from high structures, is among the most frequent methods of suicide throughout New Jersey. Because the mental health concerns of college students are strongly linked to performance stress and development determinants, it is recommended that the bridge design consider bridge suicide prevention measures outlined by the National Suicide Prevention Lifeline during construction (Draper, 2017).

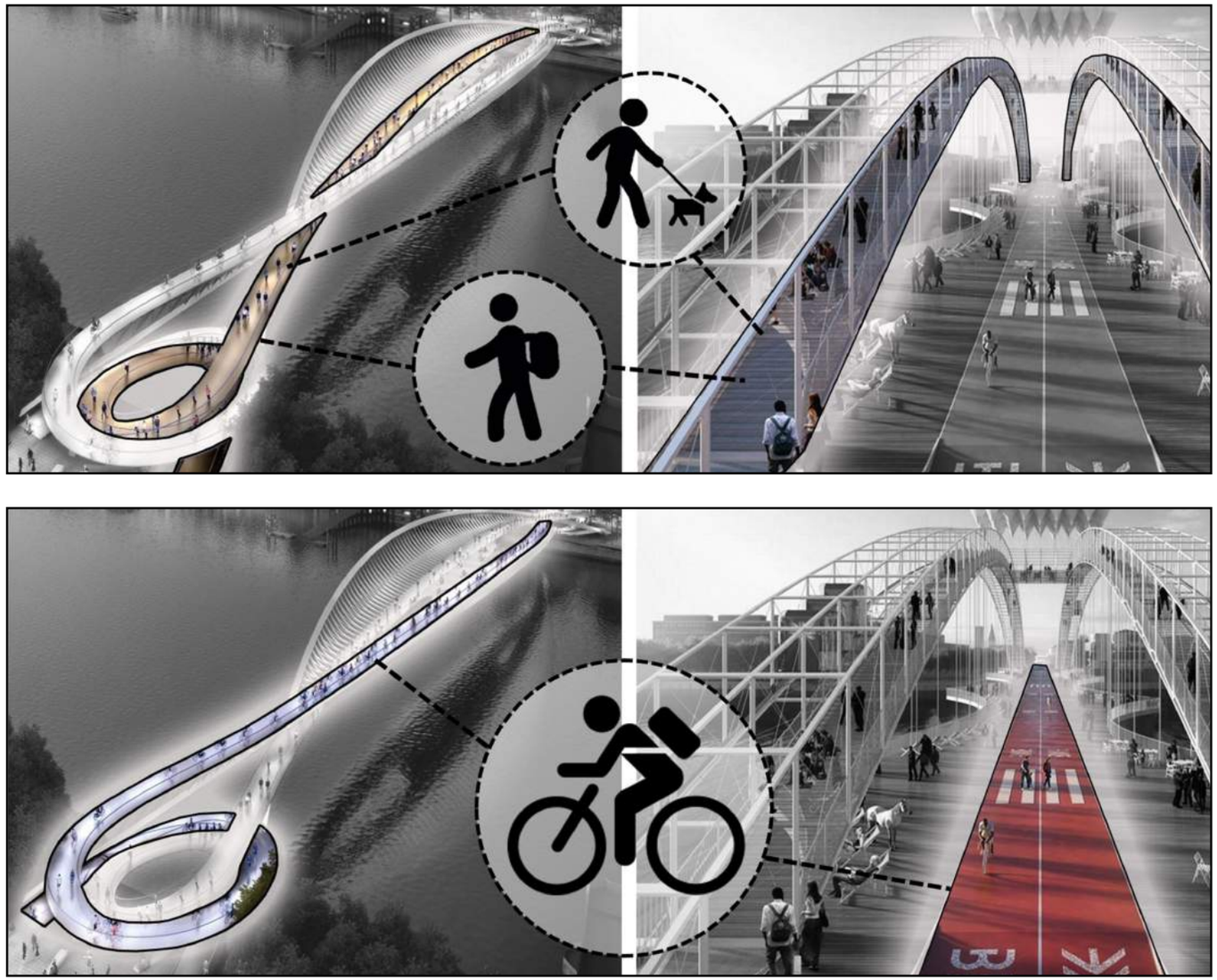


Figure 26: Rendering of options for the separation of different modes of transportation to prevent conflict and collision.

HEALTH & SAFETY | *MODE SEPARATION*

Separating paths for bicyclists and pedestrians is crucial to the functionality of the structure. Distinction between modes of transportation allows users to enjoy the bridge at their own pace with little conflict. Figure 26 shows two options for separating groups in the bridge design.

Similarly, installing bicycle maintenance structures and bicycle locks for users who arrive by bicycle and want to spend time on the bridge should be considered.

HEALTH & SAFETY | *LIGHTING*

Lighting entrances, focal points, and major elements such as towers, especially those visible to passing pedestrians and bicyclists, not only provide safety, but are also another form of wayfinding. The scene on the left shows how the lighting entrance generates an intimate scene while also providing guidance.

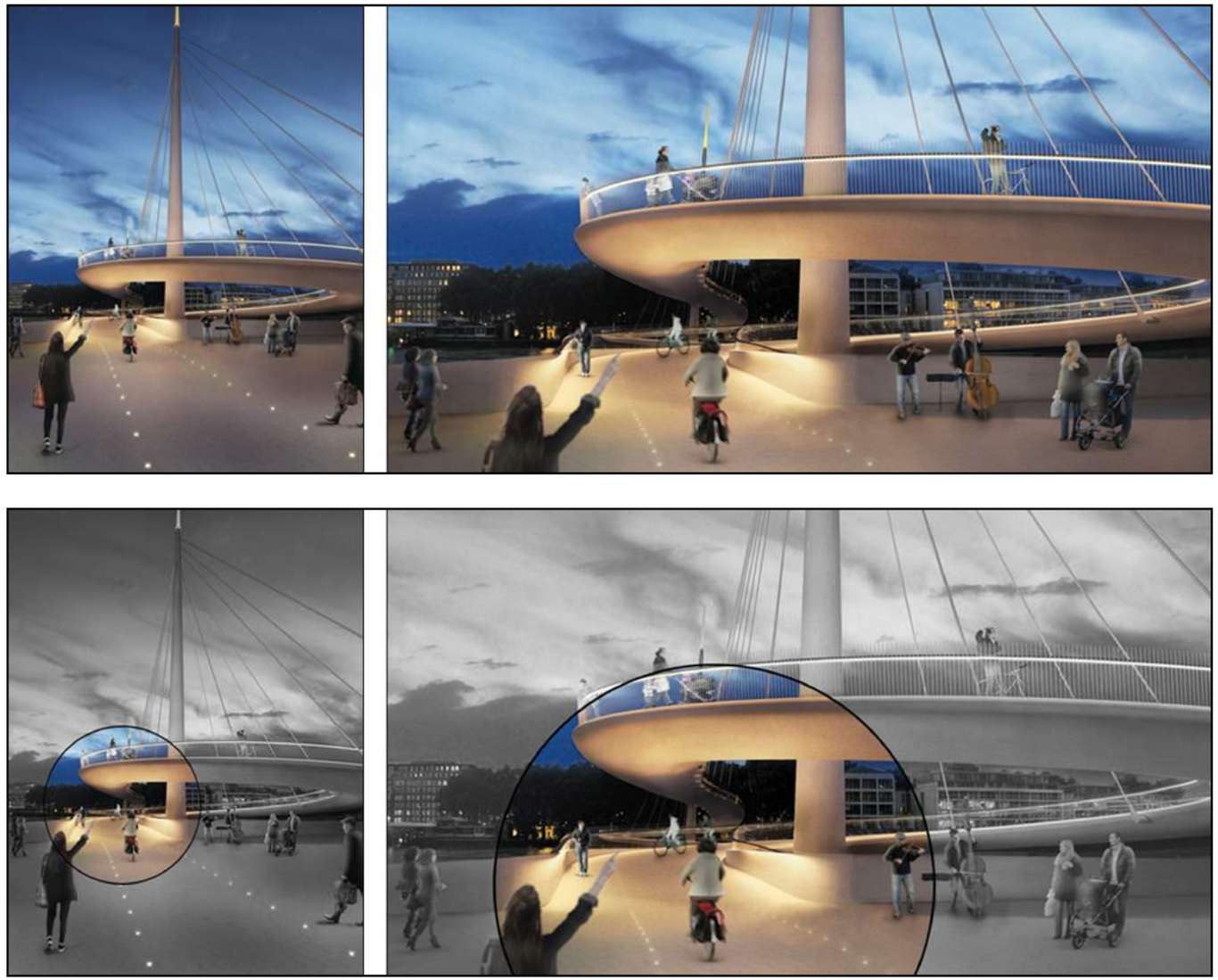


Figure 27: Rendering of options for lighting and other safety features for the proposed bridge.

RUTGERS ECOLOGICAL PRESERVE

RUTGERS ECOLOGICAL PRESERVE

The second part of the multi-modal bridge proposal is a path that cuts through the Rutgers Ecological Preserve from the end of the multi-modal bridge to Livingston Campus. The Rutgers Ecological Preserve serves the local community in a number of ways. For one, it is a place of refuge and recreation away from the urban environment and is used by students and local residents alike. It is a place where one can learn about the history of the area with old carriage roads and military bunkers as well as a place to gauge the current environmental health of the area. A number of departments including Ecology, Evolution & Natural Resources, Landscape Architecture, and Geography use this area as a living classroom to teach their courses. There is an intrinsic value to contiguously preserved natural spaces. Cutting a direct path through the Preserve could have significant detrimental impacts to the area, akin to a highway cutting through a close-knit urban neighborhood. It is for the following reasons that the studio team strongly advises against any development within the Rutgers Ecological Preserve.

ACCESS

The Rutgers 2030 Master Plan proposes a pathway through the Eco Preserve as a means of facilitating a direct link to the Livingston Campus. This, however, is not as direct as it may look from a top-down plan view. The Ecological Preserve enjoys a natural topography that is at some points rather steep, sometimes reaching slopes of nearly 10%; therefore, it would not be possible to build a direct path, straight from the entrance near the bridge to the campus. A path through the Ecological Preserve would require extensive switch-backs to accommodate the slope. Additionally, the path would need to be paved in order to ensure ADA compliant travel and to make it possible for regular bicyclists (not mountain bicyclists) to use. This development would impact much of the land that is being preserved. It is also important to note that the Eco Preserve technically closes at 5:00PM, which would further restrict access through the area for students taking evening classes.

ENVIRONMENT

The need for switchbacks and paving will use a lot of area within the Ecological Preserve that would otherwise be available for trees and plants to occupy. Considering the fact that the path would need to be at least six feet wide, a considerable amount of clearing would be required to develop a paved walkway through the area. Currently there are dirt trails that have minimal impacts on erosion and plant life because they are restricted to small areas and narrow widths. The addition of impervious surface to the area would also have an adverse impact on nearby creeks and the river. More traffic during commuting times would have an adverse effect on the wildlife in the area and may potentially conflict with ROTC training that occurs during morning hours in the Preserve.

HEALTH & SAFETY

To function as proposed, the trail extending from the bridge through the Rutgers Ecological Preserve will require lighting, patrols and, as mentioned previously, grading and construction of a walkway. Considering the health and safety concerns associated with the trail through the Rutgers University Ecological Preserve, the need for multi-modal pathways and the purpose of the Rutgers Ecological Preserve do not necessarily overlap. Currently, the area is used as a living laboratory for students and researchers requiring limited disturbance for effective experimentation (Davies et al, 2012). Engaging the existing communities and understanding the cost benefit on these implications is necessary before any further development.

HEALTH & SAFETY | *EMERGENCY VEHICLE ACCESS*

It is recommended that ground police patrols be present in these new public spaces during operating hours. This will provide safe travel for students and visitors while extinguishing any existing perception of crime For this reason, all bicycle and pedestrian paths through the Rutgers Ecological Preserve must include surfaces and widths that are conditioned for patrolling. In the event of an emergency, motorized vehicles, such as pictured in Figure 28 (bottom), must be able to access the area easily.

Figure 28: Rendering of required materiality for the bridge and trail to allow emergency vehicle access in both areas.

CHAPTER 5:
REGULATIONS

REGULATIONS

Like any built project, the proposed boardwalk and multi-modal bridge will be subject to the regulatory and permitting process. The exact details of these requirements will depend on the final design, funding, timelines, phasing, and other project specific details. For the purpose of this report, the following is a brief summary of the anticipated regulations and permitting requirements the project will fall under. For more detailed information about anticipated regulations/permitted for these projects, see Table 3 at the end of this section.

Like only ten other states in the United States, New Jersey is a home rule state. Therefore, aside from abiding by federal and state regulations, these projects also fall under the jurisdiction of county and municipal governance. Additionally, with location along a historic canal and tidal water body, the subject of these regulations range from environmental concerns to historic property stipulations (Vanlandingham 1968).

As discussed in *Existing Conditions* the project area includes habitats for threatened/endangered species and migratory birds. Depending upon the exact boundaries and extent of the project, regulatory requirements with respect to coastal areas, tidelands, wetlands, green acre laws, and possible permits will be required or exemptions granted. Additionally, the Rutgers Ecological Preserve is a critical habitat and site for vernal pools. Therefore, further consultation or environmental assessment may be required. Similarly, if federal funds are used to support the project, an Environment Impact Assessment under The National Environmental Policy Act (NEPA) will be required with consequent effects on the funding and timeline for the project.

Due to the presence of the Delaware and Raritan (D&R) historic canal on site, the D&R State Park Commission requires the review of any action in the Canal Park. This includes the review of project implications related to storm water runoff; water quality impact, stream corridor impact; visual, historic, and natural quality impact; and traffic impact. Although, not a state or local agency, the D&R Canal Commission has jurisdiction over any and all parts of the historic D&R Canal that runs through the project site.

Further, at the county level, the trails mobility policy by Middlesex County will need to be reviewed for any necessary permits, approvals, or variances. Similarly, review of all land use regulations at the municipal level for New Brunswick, Highland Park, and Piscataway is advised prior to the design development of both proposed projects.

It is recommended that any required studies and consultations be conducted prior to the design and construction of either project (i.e., environmental review, etc.). It is also important to note that some of the federal regulatory requirements have been delegated to state agencies, and may not require separate approvals at both levels.

A special thank you to Dave Charette of Langan Engineering and Environmental Services, Inc., for providing a robust outline of the regulatory process.

TABLE 4: FEDERAL REGULATIONS AND PERMIT REQUIREMENTS

Regulatory Agency	Law, Regulation, OR review procedure	Trigger of Review OR regulated activity	Approval OR Outcome	Notes
U.S. Coast Guard (USCG)	Title 33 of the Code of Federal regulations (CFR), Parts 114-115	Construction of bridges over the navigable waters of the U.S.	Bridge Permit	
U.S. Army Corps of Engineers (USACE)	Clean Water Act and Amendments, Permit Title 33 CFR 320-330	Discharge of dredged or fill material in navigable waters of the U.S.	Dredge, Fill and Rivers and Harbors Act Permit	
Federal Emergency and Management Agency (FEMA)	Guidelines and Standards for Flood Risk Analysis and Mapping	Flood Risk Analysis and Mapping	Compliance	

TABLE 5: NEW JERSEY (STATE) REGULATIONS AND PERMIT REQUIREMENTS

Regulatory Agency	Law, Regulation, OR review procedure	Trigger of Review OR regulated activity	Approval OR Outcome	Notes
The State Historic Preservation Offices (SHPO) of New Jersey	Section 106 Consultation *National Historic Preservation Act of 1996	Federal or federally assisted undertakings that could affect a historic property included in or eligible for the National Register of Historic Places	The federal agency takes into account the effect of the undertaking and allows the Advisory Council for Historic Preservation opportunity to comment. If an adverse effect is found, a Memorandum of Agreement (MOA) outlines strategies to mitigate harm.	
	New Jersey Executive Order 215 (State-level version of NEPA)	"Major federal actions significantly affecting the quality of the human environment."	The federal agency prepares an Environmental Impact Statement (EIS) outlining the project, all possible alternatives, and ways to mitigate adverse effects.	The state level review requires an EIS or the less robust Environmental Assessment (EA) depending on the intensity of the project.

TABLE 5.1: NEW JERSEY (STATE) REGULATIONS AND PERMIT REQUIREMENTS (CONT'D)

Regulatory Agency	Law, Regulation, OR review procedure	Trigger of Review OR regulated activity	Approval OR Outcome	Notes
	Section 4(f)	Requires the use of land from a historic property	The project is prohibited unless there is no "feasible and prudent alternative."	Regulatory with strict legal backing
New Jersey Department of Environmental Protection (NJDEP)	NJDEP Coastal Zone Management Rules (N.J.A.C. 7:7)	Development in Special Areas / Water Areas	Regulatory Design Standards	Other areas include: water areas, impervious coverage limitations for development, public access along waterfront, scenic resources and design, etc.
	Flood Hazard Area Control Act & NJDEP Flood Hazard Area Control Act Rules (N.J.A.C. 7:13)	Type of development allowed in floodplains, No Net Fill Requirements, Upstream and Downstream Impact Analysis, Riparian Zone Development Limitations	Regulatory Design Standards	
	Freshwater Wetlands Protection Act, P.L. 1987, c. 156; N.J.S.A. 13:98-1 et seq.	Tidelands or Riparian Grant, Lease or Conveyance	Development and use of state-owned lands which now or formerly exist below the mean high water line.	Focus of this policy is to protect and to maintain tidal lands for public uses. Tidelands Resource Council, considers Tidelands applications for impacts of conveyances upon the "public interest" or "public good".
New Jersey Department of Transportation (NJDOT)	New Jersey Highway Access Management Code (N.J.A.C.16:47)	Major Access Permit	New access or modifications for access to and from state highways.	

TABLE 5.2: NEW JERSEY (STATE) REGULATIONS AND PERMIT REQUIREMENTS (CONT'D)

Regulatory Agency	Law, Regulation, OR review procedure	Trigger of Review OR regulated activity	Approval OR Outcome	Notes
Division of Coastal Resources	N.J.S.A. 12:5-1 et seq. Water Quality Certification, U.S. Clean Water Act and some U.S. Army Corps of Engineers authorizations.	Waterfront Development Permit	Any project involving the development (meaning construction, reconstruction, alteration, expansion or enlargement of any structure, or excavation) of waterfront near or upon any tidal or navigable waterway in the State.	To provide for compatible growth along the waterfront, to try to meet the needs of the public and developers, to protect commerce, navigation, water quality and fisheries, and to maximize the resources to provide for public access, fishing, environmental concerns while still allowing for some growth along the waterfront.
	Act of 1970 N.J.S.A. 13:9A-1 et seq.	Coastal Wetlands Permit		The DEP regulates any activity having to do with the draining, dredging, excavation or removal of soil, mud, sand, gravel or depositing or dumping of rubbish, wastes, or erecting structures on coastal wetlands.
	N.J.S.A. 13:19-1 et seq.	Coastal Area Facility Review Permit	Construction of any "facility" defined in N.J.S.A. 12:19-3 in the "coastal area" as defined in N.J.S.A. 13:19-4.	There are two types of coastal wetlands permits: Type A permits are required for minor projects. Type B permits are required for projects that alter marsh contour.

TABLE 6: REGIONAL REGULATIONS AND PERMIT REQUIREMENTS

Regulatory Agency	Law, Regulation, OR review procedure	Trigger of Review OR regulated activity	Approval OR outcome	
Delaware and Raritan Canal Commission (DRCC)	D&R Canal Commission review	A public or private project proposed in the DRCC Review Zone	The Commission will send notice of approval, rejection, or modification within 45 days of a completed application. Reviews are based on 1) storm water runoff and water quality impact 2) stream corridor impact 3) visual, historic, and natural quality impact 4) traffic impact.	DRCC has Zone A (more stringent) jurisdiction over the State Park and the spillway just east of Landing Lane. If any part of a project site is in Zone A, the entire project is judged with Zone A regulations. Approval from the municipal permitting agency is a prerequisite for the visual impact review.

CHAPTER 6:
LONG-TERM SUSTAINABILITY

PROGRAMS & PARTNERSHIPS

Based on conversations with university stakeholders and students, New Brunswick residents, officials, and Rutgers students consider the current space along Route 18 and Boyd Park underutilized, isolating, and unsafe due to a lack of activity and access to the area. While the Rutgers 2030 Master Plan addresses access and connectivity issues, physical construction alone will not attract people to the area. The success of this project will depend on the cooperation of a number of players in the New Brunswick area to ensure the project's longevity and sustainability. The following are recommendations and ideas based on conversations with stakeholders and supplementary research. The key issues fall into four overarching categories, which together ensure that local communities are both economically and personally invested in the projects:

Figure 29: Categories of long-term sustainability concerns for both proposed projects.

Economic Development: Opportunities for local businesses to utilize the space and engage with the area's visitors.

Stewardship: Opportunities for students and residents to cherish and care for this stretch of the Raritan River.

Community Engagement: Opportunities to draw people of various ages and backgrounds into the area.

Outdoor Recreation: Opportunities to encourage daily use of the bridge and boardwalk for exercise.

Because many of these recommendations are based on programming, it may be prudent for future designers to consult with local stakeholders for advice on how to create a space conducive to various activities. Ideally, the incorporation of these recommendations, as well as further stakeholder engagement, will foster a feeling of ownership and responsibility among local organizations, residents, and businesses as well as the university to maintain and actively use the space, thereby ensuring its success (Campbell et al 2016).

Community Cleanups

Litter and unkempt vegetation can contribute to negative perceptions and mental health stressors, while regular maintenance and a tidy appearance can encourage more social contact (Kruger et al 2007). Rutgers University has a strong commitment to community service in the local area via its *Get Involved* program that provides students with opportunities to volunteer with local organizations (Rutgers Get Involved, 2017). Campus Greek life and student organizations often participate in events, fundraising, or

volunteering with these organizations. In fact, many of these student groups are required to have a certain number of community service hours. New Brunswick hosts a number of organizations, such as the Lower Raritan Watershed Partnership (LRWP), that run river and stream clean-ups with local residents, public schools, and university students. One opportunity to encourage stewardship of the river is to develop partnerships between Central Jersey Stream Team, Rutgers Recreation, the Lower Raritan Watershed Partnership, and Rutgers *Get Involved* to facilitate a more formalized participation in river clean-ups among Greek life, campus organizations, and regional stakeholders. Fostering stewardship of the Raritan River with Rutgers students can further the work that many organizations are currently doing to better the environment. New Brunswick's annual Urban Cleanup Week (see *Appendix B*) could devote time to the trench to bring in more New Brunswick-based groups and raise awareness of the area.

Maintenance Responsibility

According to various stakeholders, the primary cause of the trench's neglect has been an unclear distinction of maintenance responsibility among various entities in New Brunswick. Walking through the site, it is apparent from the amount of litter that the area needs more garbage cans and a larger staff to take care of it. The litter in these areas can easily get into the river and brings harm to aquatic creatures. Responsibility for maintenance will be key to ensuring the boardwalk and bridge remain safe during and after weather events such as snowstorms, windstorms, or floods. A plan for such upkeep should be developed prior to any further project development so as to establish a cost-effective solution for the local organizations involved. Shared services may be a solution to consider for maintaining the area, similar to those offered by New Jersey's Cumberland County Improvement Authority (CCIA 2018).

Food Vendors

Street food can act as a defense against homogenization and a gateway to lively public spaces, generating foot traffic for nearby brick-and-mortar restaurants and stores (Newman and Burnett article). Rutgers' food trucks, known colloquially as the "grease trucks," were a cultural icon of the New Brunswick campus, and gained further notoriety on national television for their indulgent offerings. Once stationed at Hamilton Street and College Avenue, the trucks became mobile after a campus redevelopment project known as The Yard began construction, and have since set up shop around College Avenue and other campuses nearby. As smartphone technology decreases uncertainty of food truck location, demand for the flexibility and variety they serve will grow (Annenberg and Kung article). Mobile food vendors can transition into the area down near the entrance to the boardwalk to create an attraction and amenity for visitors and local employees and residents. New Brunswick also has a number of restaurants that could take advantage

of the boardwalk project to host pop-up eateries as a part of the summertime New Brunswick Restaurant Week and other events.

Wayfinding

Wayfinding systems provide orientation and local information to visitors traveling through public space. The bridge and boardwalk projects will create new spaces that will be unfamiliar to even the most veteran local residents. The studio team recommends partnering with the New Brunswick Parks and Gardens Commission, where a citywide wayfinding plan is already in the works, to create a cohesive, welcoming, and navigable environment. This cooperation will help avoid redundancies and confusion. The New Jersey Wayfinding Master Plan recommends using simple but meaningful icons to avoid written language whenever possible (Celebrate NJ!, 2009), which is important in New Brunswick as 56% of the population speaks a language other than English at home (US Census Bureau, 2015). This signage plan may need to extend far beyond the boundaries of the site to attract visitors from the area's major highways.

Figure 30: Wayfinding example.

Interpretive Signage

There is some existing historical and ecological interpretive signage in Boyd Park, but much of it is in bad shape, missing, or outdated. The signage does include some nearby restaurants, theaters, and hotels, but does not show how close these attractions are nor does it show how to get to them. This would be an opportunity to partner with organizations such as the Lower Raritan Watershed Partnership, The Audubon Society, the City of New Brunswick, and the D&R Canal Watch to write about the ecology and historical features of the area. The signage could be incorporated throughout the project site, either at the multi-modal bridge or the boardwalk and even extending into Boyd Park.

Increased Park Programming

The New Brunswick Cultural Center currently programs a number of successful events in Boyd Park including Jazz in the Park, Hub City Sounds, Independence Day fireworks, as well as the Raritan River Festival and Rubber Duck Race. These events are free to the public and attract out-of-town visitors who are likely to visit downtown restaurants and shops during their time in the city, bringing revenue to local businesses. The events are also excellent opportunities for local residents to get together outside, which can encourage a

sense of community that enhances relationships throughout the city. A greater frequency of programming could build on these successes.

Existing Festivals

In addition to new programming, the team found that many Rutgers and New Brunswick events occur parallel to the site of the proposed riverfront boardwalk. New Brunswick Ciclovia, Rutgers - The Big Chill, and Rutgers Day (see Appendix B) are all events that blur the boundaries between city and campus because of their geographic spread throughout the city. Slightly rerouting these programs to incorporate the boardwalk and bridge will be an exciting way to incorporate more activities into the space.

Art Walk

From 2007 to 2010, the embankment wall along the Route 18 bikeway was an active open-air art walk, organized by local community groups and featuring local and visiting artists. In conversations with stakeholders, the studio team learned that the art walk was discontinued for a variety of reasons including local politics and maintenance, but none of these were deemed insurmountable obstacles if the art walk were to be revived, especially with the project's likely increase in foot traffic. The Art Walk offers almost two miles of walkable, eye-level public art space overlooking a scenic river, which is an asset for the city and community engagement, and in fact, the trench was recently visited by a Rutgers class called Spanish for Community Engagement (Image 16). To revive this community asset, we recommend partnering with coLAB Arts and local groups involved with the art walk's previous iteration. Building a higher wall where possible would block noise pollution from adjacent Route 18 and provide more art space.

Image 16: Spanish for Community Engagement, a Rutgers University field trip to the existing Art Walk.

Tourism

Over 1 million people visit the D&R Canal State Park every year, and any of those visitors who wish to continue into New Brunswick, by bike or on foot, along the trail are effectively stopped at Landing Lanewhere the trail is interrupted by the impassable spillway. As the only double lock system in the D&R Canal and the ending point of the historic district, the terminal locks in Boyd Park have a lot of potential to be developed as a tourist site. In terms of economic impact, according to a 2013 report, the biggest employment impacts from heritage tourism in New Jersey were in food/beverage and lodging, both localized sectors based on proximity to the heritage site. New Jersey as a whole had a $2.5 billion dollar GDP impact from heritage tourism (Tourism Economics, 2013). The project site could attract a wide range

of visitors from history buffs to graffiti lovers to nature enthusiasts. Events such as historical walking tours and art walks could help increase the area's tourism.

Fish Exchange: Rutgers Cooperative Extension

There is near-daily fishing in the Raritan in New Brunswick, and while fishing is linked with increased levels of place attachment and rootedness (Khakzad and Griffith, 2016), over-consumption of certain species can lead to chronic health effects (NJ Division of Fish and Wildlife). Food insecurity in New Brunswick is a pressing concern (NB Food Insecurity), and many of the local fishermen are subsistence fishing. It is likely that the proposed RU2030 projects will increase opportunities for fishing, which may lead to increased consumption of potentially contaminated fish. While concerning, this is an opportunity for Rutgers researchers to partner with local food security organizations. The studio team researched a fish exchange that the Rutgers Cooperative Extension conducted in the Lower Passaic River, and outlined the following recommendations for a similar program tailored to the Raritan's needs. (1) Conduct a survey to gauge fishing and consumption habits, (2) establish a fish exchange program where fishermen can turn in contaminated fish on-site, in exchange for a voucher to the New Brunswick Community Farmers' Market and other local grocers, and (3) test the fish for toxicity to capture data on the health of the river's fish species. Local pharmaceutical institutions committed to public health could help fund the program.

Landings & Channel Markers

New Brunswick is eleven nautical miles from the Raritan Bay via the river. It would take a boater approximately one hour to reach the city from the bay, however, very few boaters make the trip upstream to the city. In talking to stakeholders, the team found that there are two major barriers to waterway accessibility in the area. The first one is the New Brunswick Landing; the project was opened in 2012 thanks to the collaboration of the City of New Brunswick and the Board of Chosen

Image 17: The New Brunswick Landing

Freeholders. The Landings need to be removed each winter to prevent ice damage and in recent years have not been replaced due to a lack of staff, funding, and need for repairs preventing boaters from tying up at Boyd Park. Another barrier to waterway usage is the need to update

[SM30] channel markers. Many boaters believe that the channel markers are not updated or find them difficult to read, which prevents them from using the river to travel due to a fear of shallow waters and running aground. Rutgers could work with Middlesex County Parks and the City of New Brunswick to address these two issues in order to invite more visitors to the boardwalk, multi-modal bridge and the general area. This could be both an opportunity for more tourism on the river and an attraction for residents and students visiting the riverfront.

Fitness Equipment and Track Surfaces

To get the most use out of the proposed project site, the bridge and boardwalk could become New Brunswick's "open-air gym". Amenities such as outdoor fitness equipment and track surfaces are becoming increasingly popular in city parks according to the Trust for Public Land (Trust for Public Land 2011). New York City Parks have been successful in implementing outdoor equipment in a number of parks as well as exercise programming that is free to the public (NYC Parks 2018). Track surfaces on the boardwalk and bridge deck would allow students, runners, and lunchtime employees to have more variety in where they walk or jog, including a particularly long track leading to the D&R Canal State Park. More use of the area would also bring attention to the Rutgers Crew team.

Rentals and Lessons

Both on the water and on the land, the project site provides the chance for rentals, lessons, and fitness classes. Sunset Kayaking, one of the most popular Rutgers Recreation programs in the last year, allows Rutgers students, who might never have spent time near the Raritan, an opportunity for an intimate encounter with the river. Canoeing and kayaking is a great way to attract users to the area. Through a partnership with New Brunswick Recreation, Rutgers Recreation could develop a seasonal canoe and kayak rental at the boat house in Boyd Park. This could attract visitors from nearby municipalities, the university community, or local residents to enjoy paddling on the river. Rutgers currently collects student fees to fund recreational programs at the university; a rental program could provide additional funds to supplement the program. A partnership with New Brunswick Recreation could also facilitate more exercise and health-related programming in the parks for area residents. Rutgers could consider hosting its "Yoga in the Park" event at Boyd Park or on the bridge or boardwalk to introduce students and locals to the new spaces. According to the Project for Public Spaces, partnerships for public parks often help create a sense of community that encourage a feeling of ownership among users (MacIver 2010).

FUNDING

Compiled below are funding sources, which aside from contributing to capital projects, can support the team's recommendations for long-term sustainability. These sources adhere to the Lighter Quicker Cheaper (LQC) strategy for public spaces, a concept developed by Eric Reynolds from Urban Space Management (MacIver, 2010). LQC refers to a low-cost, non-invasive surgery type of interventions that can have large impacts on how public space serves its users. The funding list supports a range of projects from historic preservation to bicycle and pedestrian infrastructure to civic engagement. The grants themselves range from a few thousand to several hundred thousand dollars, and derive from both public agencies and private organizations.

Additionally, a list of other potential funders or partners were added for reference.

Middlesex County Conservation Corps
http://www.middlesexcountynj.gov

Community Assistance in Conservation and Outdoor Recreation (National Park Service)
http://www.nps.gov/orgs/rtca/apply.htm

The Kresge Foundation
http://kresge.org/opportunities.html

Robert Wood Johnson Foundation
http://www.rwjf.org/en/how-we-work/grants-explorer/funding-opportunities.html

Grassroots Grants to improve green spaces
http://scottsmiraclegro.com/responsibility/gro1000/

National Association of Realtors, Placemaking Micro-Grant
http://www.nar.realtor/grants/placemaking-micro-grant

Home Depot, Community Impacts Grant Program
https://corporate.homedepot.com/community/home-depot-fundation-grants

Wells Fargo, Environmental Grants
http://www.wellsfargo.com/about/corporate-responsibility/community-giving/

TABLE 7: NATIONAL FUNDING SOURCES AVAILABLE

Agency	Grant	Amount	Description	Relevance	Source
ArtPlace America	**National Creative Placemaking Fund**	$50,000-$500,000 $253,750*	Funding for communities across the country where artists, arts organizations, and arts and culture activity help drive community development	place-based community development incorporating arts and culture.	http://www.state.nj.us/transportation/business/localaid/alternatives.shtm

** New Jersey average award amount, 2017.*

TABLE 7.1: NATIONAL FUNDING SOURCES AVAILABLE (CONT'D)

Agency	Grant	Amount	Description	Relevance	Source
Fixing America's Surface Transportation Act (FAST Act)	**Transportation Alternatives**	$722,054**	"...encompassing a variety of smaller-scale transportation projects such as pedestrian and bicycle facilities, recreational trails, safe routes to school projects, community improvements such as historic preservation and vegetation management, and environmental mitigation related to stormwater and habitat connectivity."	bicycle and pedestrian infrastructure construction and lighting, scenic overlook construction, rehabilitation of historic transportation facilities, vegetation management for improved safety, archaeological activities resulting from transportation projects, connectivity restoration for aquatic and terrestrial habitats.	http://www.state.nj.us/transportation/business/localaid/alternatives.shtm
National Endowment for the Arts	**Our Town**	$25,000-$200,000	"...supports creative placemaking projects that help to transform communities into lively, beautiful, and resilient places – achieving these community goals through strategies that incorporate arts, culture, and/or design."	creative placemaking Applications require partnership and matching funds	https://www.arts.gov/grants-organizations/our-town/introduction
National Trust for Historic Preservation	**Johanna Favrot Fund for Historic Preservation**	$2,500-$15,000	"The fund aims to save historic environments in order to foster an appreciation of our nation's diverse cultural heritage and to preserve and revitalize the livability of the nation's communities."	preservation planning, marketing, physical repairs	http://forum.savingplaces.org/build/funding/grant-seekers/specialprograms/favrot-fund
	National Trust Preservation Funds	$2,500-$5,000	"...to encourage preservation at the local level by providing seed money for preservation projects."	preservation planning, preservation education and outreach. Applicants must be members of either the Trust Preservation Leadership Forum or Main Street America.	https://forum.savingplaces.org/build/funding/grant-seekers/preservation-funds?

*** New Jersey average award amount, 2016.*

TABLE 7.2: NATIONAL FUNDING SOURCES AVAILABLE (CONT'D)

Agency	Grant	Amount	Description	Relevance	Source
National Trust for Historic Preservation	**Henry A. Jordan, M.D., Preservation Excellence Fund**	up to $5,000	Provides funding to deserving organizations demonstrating commitment to the protection of natural and cultural resources in the Mid-Atlantic region	preservation planning, preservation education and outreach	http://forum.savingplaces.org/build/funding/grant-seekers/specialprograms/jordan-fund
Sign Research Foundation	**Research Grants**	up to $50,000	Subject areas, include: Wayfinding, Branded Environments, City Identity, Conspicuity, Economic Value of Signage, Quantified Impact of Signage, Code Impacts, Evidence Based Design, Digital Signage, ADA, Signage & Advertising as City Revenue, Traffic and Pedestrian Safety, Future Technologies/Disruptive Technologies, Placemaking, Best Practices, and Case Studies	wayfinding, ADA, pedestrian safety.	http://www.signresearch.org/grants/

TABLE 8: STATE FUNDING SOURCES AVAILABLE

Agency	Grant	Amount	Description	Relevance	Source
New Jersey Department of Transportation	**Municipal Aid Program**	$215,270*	Provides grant funds to municipalities committed to advancing projects that promote safety, renew aging infrastructure and support the State's economy with new transportation opportunities.	bikeway construction, bridge preservation, pedestrian safety, historic preservation, environmental mitigation.	http://www.state.nj.us/transportation/business/localaid/municaid.shtm
	Local Bridges, Future Needs	$1,612,903*	Provides funding for the improvement of county jurisdiction bridges	Landing Lane pedestrian safety, connection between D&R Canal and boardwalk	http://www.state.nj.us/transportation/business/localaid/localbridges.shtm

** New Jersey average award amount, 2017.*

TABLE 8.1: STATE FUNDING SOURCES AVAILABLE (CONT'D)

Agency	Grant	Amount	Description	Relevance	Source
New Jersey Heritage Trust	**Preserve New Jersey Historic Preservation Fund**	$119,554** (mode for 2016: $150,000)	Provides an annual source of matching planning and capital grants from the state's corporate business tax for historic preservation projects."	physical repairs, preservation planning, ADA compliance, interpretive and directional signage, walking tours, safety improvements Grantees often use a first grant for preservation planning and feasibility studies, and a second one a few years later to implement the recommendations from those plans.	http://www.njht.org/dca/njht/programs/preservenj
New Jersey Division of Highway Traffic Safety	**HTS Grants**	$425,000*	Offers, on an annual basis, federal grant funding to agencies that wish to undertake programs designed to reduce motor vehicle crashes, injuries, and fatalities on the roads of New Jersey	traffic safety, bicycle and pedestrian safety	http://www.nj.gov/oag/hts/grants/index_central.html

** New Jersey average award amount, 2017.*
*** New Jersey average award amount, 2016.*

CHAPTER 7:

CONCLUSIONS

CONCLUSIONS

Of the many recommendations detailed above, there are four primary outcomes of the research behind this report.

1. The bridge and boardwalk projects can become iconic destinations for 21st century New Brunswick, Piscataway, and the wider Rutgers community, far beyond functioning as only transit routes.

2. The site is not a blank canvas, and contains existing spaces that are highly valued by the Rutgers and New Brunswick communities.

3. If properly enhanced, existing infrastructure could alleviate some of the connectivity issues outlined in the Rutgers 2030 Master Plan.

4. All recommendations provided can be used in an integrated way, incorporating multiple perspectives based on site-specific context.

Public access is not merely a physical path. Without social inclusion and robust programming, physical access to the space is rendered moot. The recommendations above lay a foundation for user interaction with the site to ensure the long-term success of the projects. To continue the Raritan riverfront's active use, stakeholder engagement will be a key component of this foundation, which must include open communication with local organizations and stakeholders throughout the planning, construction, and ongoing development of the project. The site's programming should encourage economic development, stewardship, community engagement, outdoor recreation, and most importantly, a sense of ownership to appeal to a wide variety of users and maintain a public need for the space. To assist with outreach to existing stakeholders, see *Appendix C* for an initial list of people and organizations to engage.

NEXT STEPS

Before the plan's implementation, a few important next steps are necessary to address key issues at the project site. First and foremost would be a thorough account of homelessness in New Brunswick's riparian edge, which was beyond the scope of this studio. Coming Home of Middlesex County, a local organization committed to ending homelessness, conducts yearly surveys and has experience creating affordable housing for the formerly homeless, making them a useful partner for this research. Another important issue is the programming of the space. Public access is not just a physical path. It requires social inclusion and representation, otherwise the path itself is moot. Construction planning activities must coincide with robust programming informed by stakeholder outreach. A general meeting with all stakeholders can help identify those who will play a bigger role in either the support or opposition. This would be an ideal scenario for brainstorming partnerships and discussing issues of maintenance, promotion, and other opportunities for partnerships.

PHASING

Table 7 shows how projects can be phased and organizes sub-projects based on priority and difficulty in implementation (cost, construction disruption, regulatory requirements, etc.). Immediate priority projects are those that can be accomplished with relative ease, creating function and connectivity where there was previously none and generating public interest in future phases of the plan. These are the "low-hanging fruit" of the two elements. Later phases of the plan include "big-ticket" items, the amenities necessary for their success, and the enhancement of existing access infrastructure.

	PROJECT PRIORITY			DIFFICULTY
	IMMEDIATE (2020)	*SHORT TERM (2025)*	*LONG TERM (2030)*	
Provide basic maintanence in existing "Trench" bikeway	X			*Low*
Implement wayfinding scheme along existing "Trench" bikeway and surrounding park network	X			*Low*
Construct walking bridge to connect D&R Canal over the spillway	X			*Medium*
Connect D&R Canal State Park walking path to existing "Trench" bikeway	X			*Medium*
Construct boardwalk		X		*High*
Provide amenities along boardwalk		X		*Low*
Enhance Cedar Lane bikeway with bike maintanence amenities and racks		X		*Medium*
Enhance Route 27 access point with safety measures		X		*Medium*
Enhance George Street access point with safety measures		X		*Medium*
Construct multi-modal bridge over Raritan River			X	*High*
Provide amenities along bridge			X	*Low*
Connect newly built multi-modal bridge and boardwalk			X	*Medium*

Table 9: Potential project phasing.

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APPENDIX A:
CASE STUDIES

PROPOCANY LAKE PROMENADE

Tychy, Poland

Paprocany lake is located in Tychy, Poland, and it's the place where the neighborhood residents spend their free time.

The wooden promenade is located along the lake bank which meanders out over the water and back on the ground. Such rhythm allows for a different perception of space from various spots of the project.

The promenade connects with a pedestrian/bicycle path that runs on the back side and descends towards the lake nearly touching the water. Fun for people of all ages is a net stretched over the water and specially designed benches that serve as tribunes for water sport competitions that take place on the lake. The project also features a sand beach and outdoor gym.

The natural materials emphasize the natural character of the area. Part of the intervention was covered by land and planted with grass. The finishes in the promenade area, including benches and the railings were built in softwood. Hardened areas such as bike parking and the gym equipment floor were made from completely water permeable surfaces based on mineral aggregates and EPDM granules. Sections of the promenade which are over the lake were constructed with steel beams founded on reinforced concrete piles hammered into the lake bottom. The promenade is illuminated only by energy-saving LED lights.

The project area is about 5 acres and the promenade length along the bank is 1,312 feet. Before the project was built, the terrain was only a lawn by the road, and in spite of landscape values, was completely unused except by fishermen, who now enjoy the activity even more.

STATUS
Built

YEAR COMPLETED
2014

DESIGN FIRM
RS+

OTHER TECHNICAL INFORMATION
Area: 5 acres
Length: 1,312 feet

CHARACTERISTICS TO CONSIDER FOR THE RUTGERS BOARDWALK

- Fun amenities like the stretched net over water and the outdoor gym attracts users of all ages
- Benches were specially designed to be used as tribunes for water sports
- Illumination is only with energy-saving LED lights
- All surfaces are 100% permeable

GARDEN BRIDGE

London, England

Over the past 20 years, the South Bank area in London has seen a revitalization and development of an arts, entertainment and commercial district. Given the need to physically bring more people by foot to this area of the city, in 2013 the Transport of London invited three companies to tender for the design contract for a pedestrian bridge from Temple to Southbank areas. Heatherwick Studio was awarded the contract and designed the Garden Bridge, a new landmark proposed for Central London.

The bridge is designed as a place with no noise or traffic, with grasses, trees, wild flowers and plants unique to London's natural riverside habitat. The bridge is intended to be the slowest way to cross the river, since people will want to stay in its different spaces and stare at the great cityscapes all around, it will be a better and safer way to cross the river and enjoy the remarkable river setting.

The structure widens and narrows across its path and it plays with vegetation scales, openness and intimacy.

STATUS
Standby. Curent Mayor inherited project from former. Current administration says there are no funds.

YEAR DESIGNED
2013

DESIGN FIRM
Heatherwick Studio

BUDGET
300 million USD

OTHER TECHNICAL INFORMATION
Engineering : Arup
Lenght: 1,200 feet
Width: 154 feet
Annual maintenance costs estimated at $3 to $4 million

CHARACTERISTICS TO CONSIDER FOR THE RUTGERS BRIDGE
- Features resting stops for people to lean on parapets and stare at the great cityscapes
- Plants from London's natural riverside habitat were integrated in the landscape design
- Bridge landings feature elevators instead of steps for pedestrians given the height differences

PROVIDENCE PEDESTRIAN BRIDGE

Providence, Rhode Island

The Providence Pedestrian bridge is designed to connect former Route 195 parcels on either side of the Providence River, where two future parks are to be built, strengthening the conenction betwen the city's College Hill and Fox Point neighborhoods with downtown.

This intervention expects to completely transform the spatial character of the Jewelry District/Old Harbor and its designers envisioned a potential much larger than a pure connector. It is seen as a spatial mediator between urban and ecological spaces and function as an integrated series of programs into the waterfront public spaces. The east and west become a singular public space. The structure is understood less as a bridge and more as an urban intervention.

The structural design takes full advantage of pylons left from I-195, and positions the bridge over them with Glue Laminated Timber as the primary structural material in conjunction with discrete high strength steel tension rod components.

STATUS
Under Construction

YEAR DESIGNED
2011

YEAR COMPLETED
N/A

DESIGN FIRM
inFORM Studio

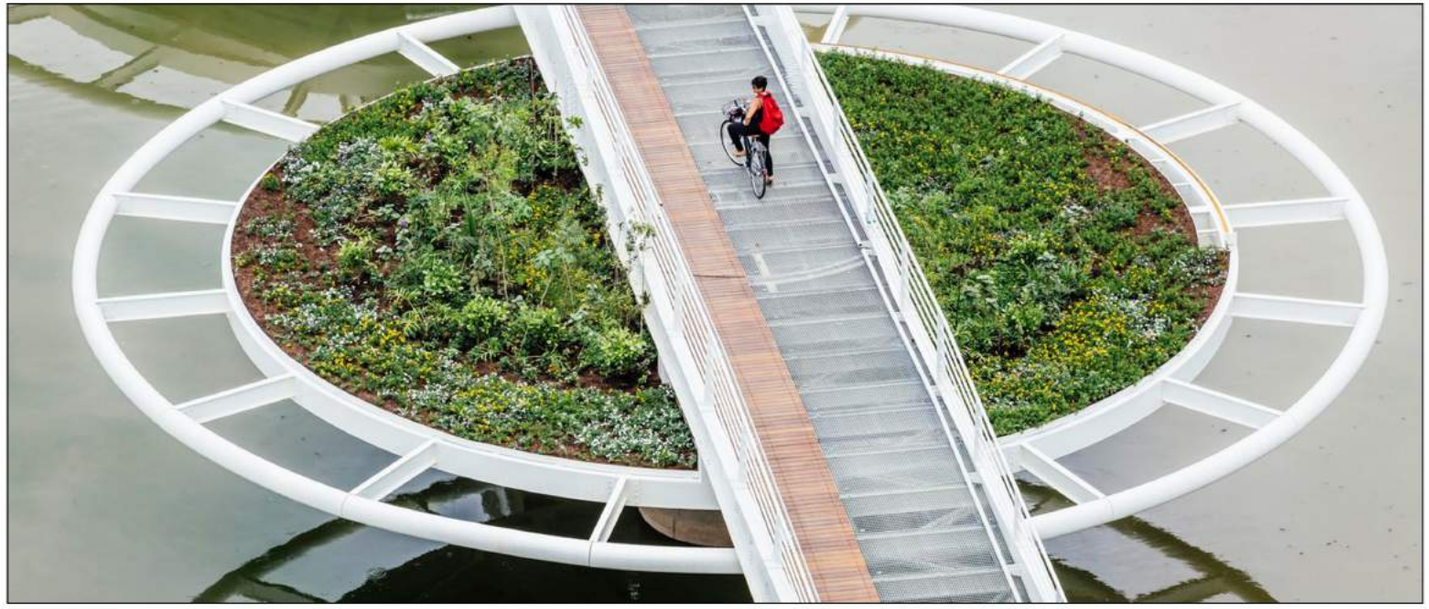
BUDGET
$16.9 million

PROCUREMENT PROCESS:
Design Competition (RFQ by American Society of Lanscape Architects)

OTHER TECHNICAL INFORMATION
Width: approx 140 feet
Length: approx. 450 feet
Structural Engineer: Bruno Happold

CHARACTERISTICS TO CONSIDER FOR THE RUTGERS BRIDGE

- Features a commercial unit within the bridge for economic opportunities
- Both landings are in parks, which feature amenities like art sculptures and operate in conjunction with bridge
- Vegetation terraces beautify the bridge



BAYER BRIDGE

Sao Paulo, Brazil

The Bayer Bridge is a small scale structure for bicyclists and pedestrians located in front of the German Pharmaceutical Bayer over the Guarapiranga Canal at the confluence with the Pinheiros River. It allows for over 2,000 employees and the community in general to become closer to the metro station. This bridge allowed for the implementation of a new 3km bike route that runs parallel to the river, which connects the district of Socorro to the nearby Santo Amaro and the metro station. The structure is also a space to contemplate the landscape.

The conceptual design was inspired by waterlilies and is movable. The structure can be swept open and create a navigable path of 12 meters. The bridge consists of two round platforms supported by concrete pillars. These "islands" are surrounded by gardens planted with native species. The vegetation reduces carbon dioxide emissions into the atmosphere by round 300 tons per year. The main deck is made of see-through metal grating and wood planks. Different materials separate the pedestrian traffic from the cyclist route.

The project was a collaboration between Bayer Brazil, the Department of Energy and the Metropolitan Water and Energy Company (EMAE). While the structure itself was fully funded by Bayer costing approximately $2 million, the total cost of the project was approximately $5 million the remainder being funded by the city for the riverbank regeneration.

STATUS
Built

YEAR DESIGNED
2013

YEAR COMPLETED
2014

DESIGN FIRM
LoebCapote Arquitetura e Urbanismo

BUDGET
$5 million

OTHER TECHNICAL INFORMATION
Engineering: Grupo Dois Engenharia Ltda
Foundation: Appogeo Consultoria de Projetos
Construction: Jz Engenharia
Lenght: 295 feet

CHARACTERISTICS TO CONSIDER FOR THE RUTGERS BRIDGE

- Simple material distinction separates the pedestrian traffic from the bicycle traffic
- Native vegetation was incorporated into the design and contributes to sustainable development
- The bridge was built through a private – public partnership

T A B I A T
PEDESTRIAN BRIDGE

T e h r a n , I r a n

Tabiat Bridge is located in northern Tehran and is the largest pedestrian bridge in Iran. It connects two public parks by spanning over Shahid Modarres, one of the major highways of the city. 'Tabiat' means 'Nature' in Persian.

The bridge consists of a three dimensional trusses with 2 levels that are supported by 3 tree-shaped columns. The length is approximately 886 feet. Viewing decks are platforms that sit on the main columns. All levels are connected by multiple ramps and stairs, allowing for diverse travel paths.

The architectural design was based on five premises
1- The bridge is not only a connector of two points but a connector of multiple points on either side
2-Bridge is not only a path to pass but a place to stay
3- The bridge has a curvilinear plan, which as a result, avoids one-point perspective
4- Location of minimum trees were selected for locating the columns, therefor minimizing impact on the existing trees
5- Depth of the structure is big enough to make it an architectural space

The architectural and structural design of the bridge happened between fall 2009 and fall 2010. It was built between fall 2010 and fall 2014. It was inaugurated in October 2014 as the third symbol of Tehran.

STATUS
Built

YEAR DESIGNED
2010

YEAR COMPLETED
2014

DESIGN FIRM
Diba Tensile Architecture

COST
18.2 million USD

OTHER TECHNICAL INFORMATION
Lenght: 886 feet
Total Surface Area: 85,573 sq ft

CHARACTERISTICS TO CONSIDER FOR THE RUTGERS BRIDGE
- The design takes advantage of the structural needs (truss height) to generate architectural spaces, overlooking the city.
- The gardens and light design play a huge role on the character and ambiance of the bridge.

BICYCLE SNAKE

Copenhagen, Denmark

The snake bridge was the solution to a reoccurring problem in the area around Fisketorvet shopping center. There were two groups of users, cyclists and pedestrians. On one hand, around 12,000 cyclists needing to get easily from Kalvebod Brygge over to Island Brygge on a daily basis, and on the other hand, pedestrians visiting the shopping center or just staying in the public bath area. This was a conflict of interests.

The snake bridge was introduced as a bicycle ramp/bridge that takes off from Havneholmen and continues in a winding course along Fisketorvet towards the shopping center's main entrance. The bridge completely separates cyclists from pedestrians and has therefor solved a large logistic problem.

The cyclists now pass quickly and efficiently through the area, while experiencing a unique and exciting view. Finally, the elevated road allows pedestrians the use of the entire wharf avoiding dangerous situations.

The bicycle snake meanders 20-23 feet above sea level with a length of 190 meters and 623 feet of ramp. The bridge is made of steel, making it light and elegant. The surface has a bright orange color, which creates a clear visual course for cyclists.

With built-in lighting, the bridge is clearly illuminated at night. It enhances the area as a bright visual element.

STATUS
Built

YEAR COMPLETED
2014

DESIGN FIRM
DISSING+WEITLING Architecture

COST
5.74 million USD

OTHER TECHNICAL INFORMATION
Engineering: Rambøll
Construction: MT Højgaard
Area: 2,530 sq ft.
Length: 623 feet
Daily Bicyclist Users: 12,500

CHARACTERISTICS TO CONSIDER FOR THE RUTGERS BRIDGE
- The simplicity of the design reduces costs
- The combination of innovative paint color and lighting design makes the bridge a landmark for the area

SCHUYLKILL BANKS BOARDWALK

Philadelphia, Pennsylvania

The Schuylkill Banks Boardwalk is a 2,000-foot-long pathway that extends the Schuylkill River Trail from Locust to South Street. The scenic path allows pedestrians, runners and bicyclists to enjoy walking over the river to the best Philadelphia skyline views.

The pathway connects to the South Street Bridge via a 460-foot-long ramp that provides pedestrian, bicycle and ADA-compliant access to the Schuylkill River Trail.

The over-the-water path is 15-feet wide and also features four widened overlooks with benches ideal for fishing, taking in the waterfront views and general hanging out. The trail is popular for evening runs and rides, so Schuylkill Banks lined the entire path with solar-powered overhead lights.

The Schuylkill River Trail is one of the most-used parks in Center City Philadelphia with more than 19,000 users every week. The trail is popular with runners, walkers and bikers, and the boardwalk another addition to the park's repertoire, connecting the trail to University City and beyond.

STATUS
Built

YEAR COMPLETED
2014

DESIGN FIRM
URS Corp. (An AECOM company)

COST
18 million USD

OTHER TECHNICAL INFORMATION
Length: 2,000 ft
Width: 15 ft
Distance from shore: 50 ft
Weekly users: 19,000
Access points: 3
Owner: City of Philadelphia Parks and Recreation
Project Management: Schuylkill River Development Corp.
Contractor: Weeks Marine
Structural/Civil Engineer :URS Corp.

CHARACTERISTICS TO CONSIDER FOR THE RUTGERS BOARDWALK
- The boardwalk path features solar-powered overhead lights because it is very popular at night
- The project encourages fishing and provides amenities like benches in overlooks to make this activity more feasible
- The boardwalk has a considerable offset from the shore

APPENDIX B:
MAPS

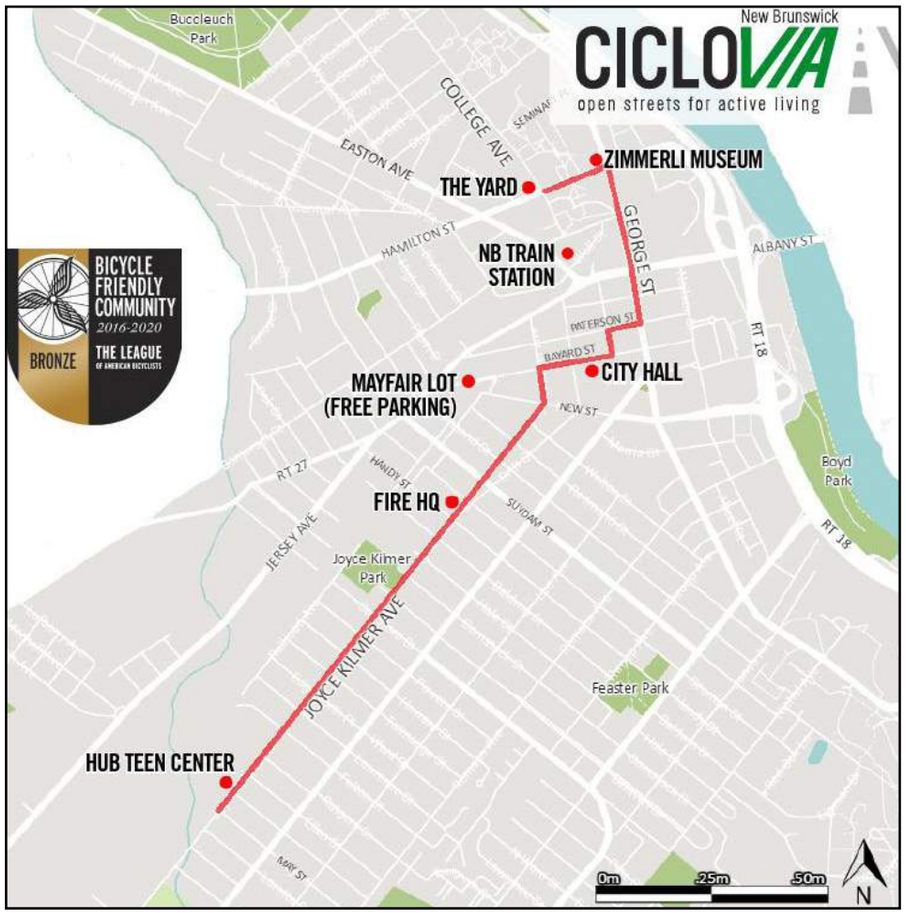
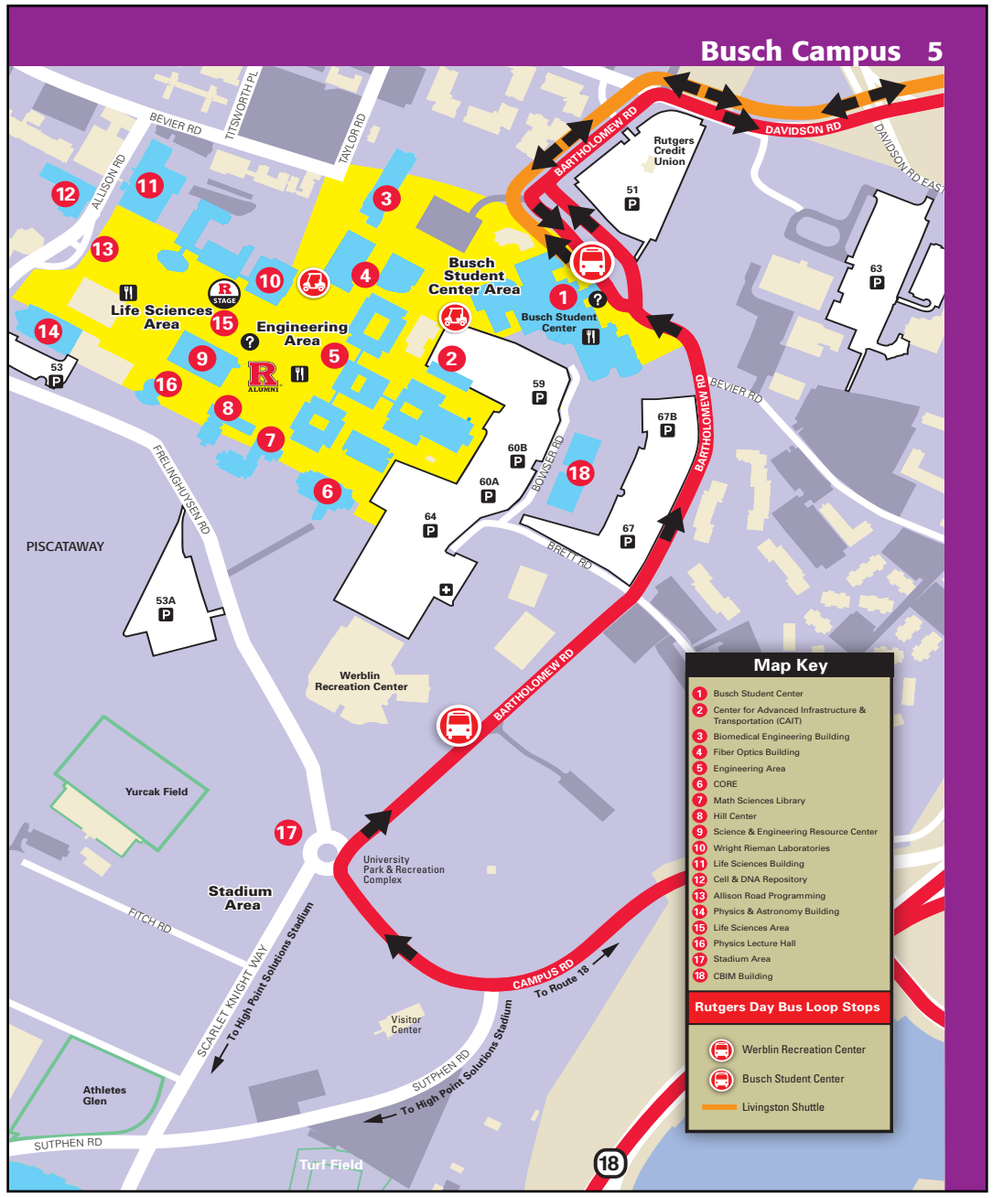


Figure 31: Map of New Brunswick's Ciclovia, an event that opens the streets of downtown New Brunswick to bicyclists, pedestrians, and other non-motorized vehicles. Source: http://newbrunswickciclovia.com/maps/

Figure 32: Map of the Big Chill 5k, an event hosted by Rutgers Recreation. Source: http://recreation.rutgers.edu/big-chill/.



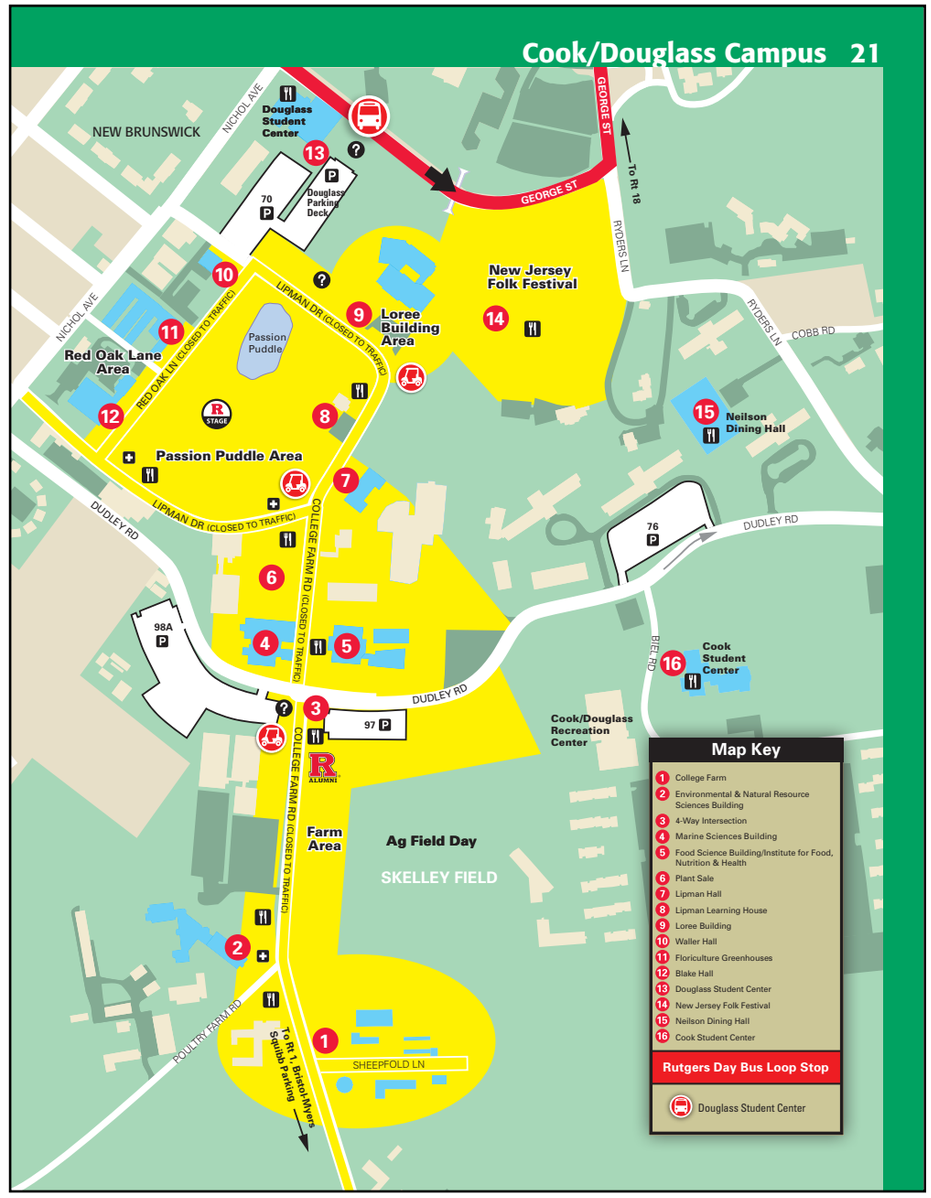


Figure 33: (left) Map of the Busch Campus on Rutgers Day, a university wide event that takes place in April.

Figure 34: (right) Map of Cook/Douglass Campus on Rutgers Day, a university wide event that takes place in April.

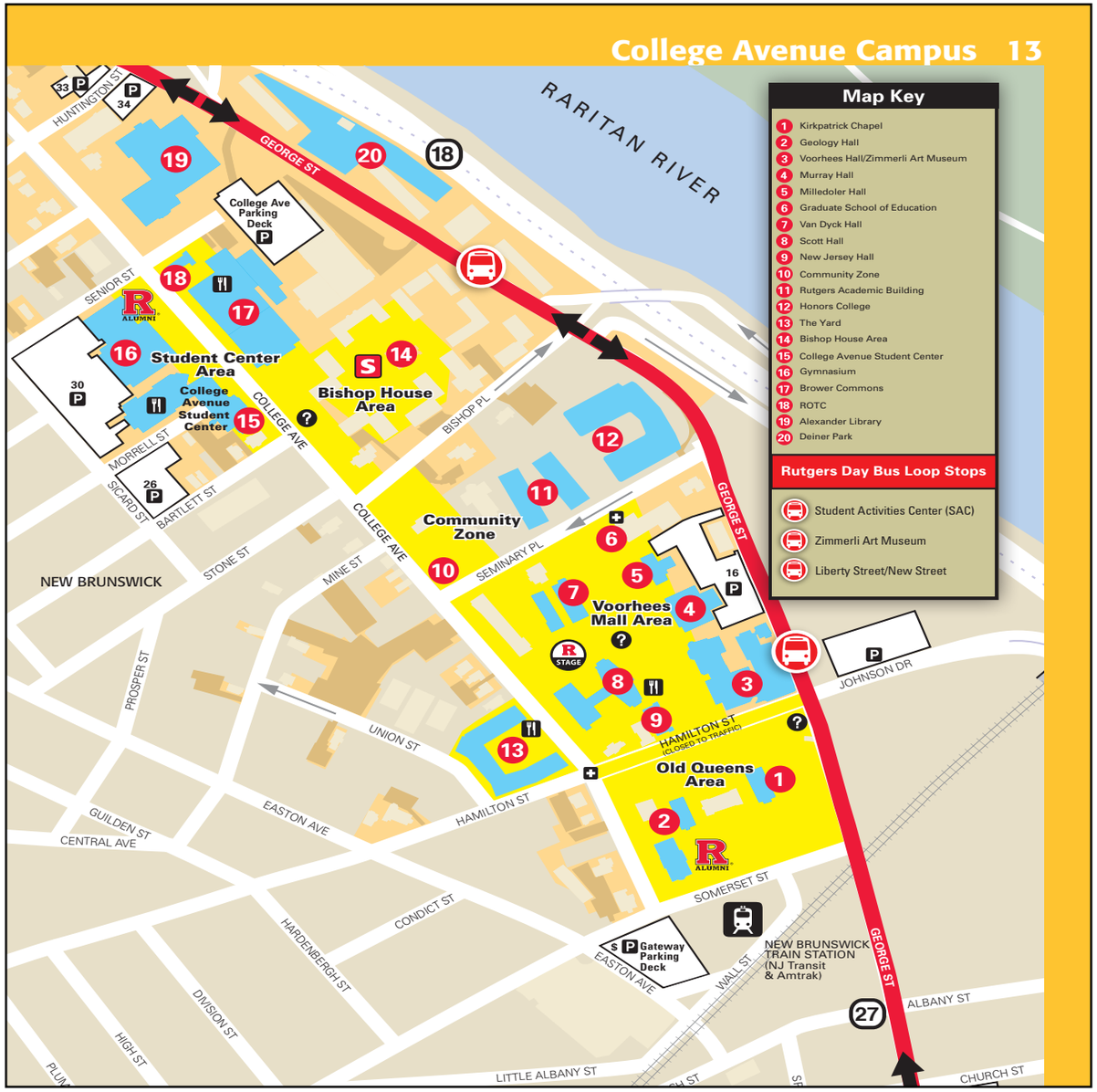


Figure 35: (right) Map of College Avenue Campus on Rutgers Day, a university wide event that takes place in April.

APPENDIX C:
STAKEHOLDERS

	Proximity	Environment	Cultural/Historic	Public Access	Regulatory	Transportation	Economic
Rutgers University	X	X	X	X	X	X	X
Rutgers Recreation		X		X			
Rutgers Ecological Preserve		X		X			
Rutgers Department of Transportation						X	
Army Corps of Engineers					X	X	
The City of New Brunswick							
Parks and Gardens Commission		X	X	X			
Recreation				X			
Parks Department		X		X			
Environmental Commission		X					
DEVCO	X						X
co-LAB Arts			X	X			
D&R Canal Commission			X				
East Coast Greenway Alliance				X			X
Highland Park Borough							
Environmental Commission		X					
Johnson & Johnson Global HQ	X						X
Lower Raritan Watershed Partnership (LRWP)		X		X			
Middlesex County							
Office of Parks and Recreation		X			X		
New Jersey Water Supply Authority	X						
NJ Audubon		X	X				
NJTPA						X	
NJDEP							
Coastal and Land Use Planning					X		

Table 10: Potential stakeholders and partner organizations.

	Proximity	Environment	Cultural/Historic	Public Access	Regulatory	Transportation	Economic
Division of Fish & Wildlife		X					
Green Acres Program		X					
Historic Preservation Office (HPO)			X				
D&R Canal State Park		X	X				
NJDOT					X	X	
NY-NJ Harbor and Estuary Program		X					
Raritan River Environmental Festival & Rubber Duck Race			X				
Raritan Riverkeeper		X					
The Trust for Public Land		X		X			
New Brunswick Cultural Center			X				
Middlesex County Office of Culture and Heritage			X				
Raices Cultural Center			X				
Family Arts Movement			X				
Drew University Irish Studies			X				
Irish American Cultural Institute			X				
American Irish Association of Woodbridge			X				
NYU Glucksman Ireland House			X				
Irish Arts Center (NYC)			X				
The Nature Conservancy		X					

Table 11: Potential stakeholders and partner organizations (cont'd).