

NEW BRUNSWICK MUNICIPAL PUBLIC ACCESS PLAN  
DESKTOP HEALTH IMPACT ASSESSMENT

2017



RUTGERS

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# NEW BRUNSWICK MUNICIPAL PUBLIC ACCESS PLAN DESKTOP HEALTH IMPACT ASSESSMENT

## I. INTRODUCTION

Increasing evidence indicates that our health is not determined solely by our behavior, choices, and genetics. Health is determined by many different components including socio-economic status and where a person lives and works. A Health Impact Assessment (HIA) provides decision-makers with an opportunity to understand the impacts of decisions on affected communities, and to consider recommendations for how the proposed activities and changes can best support public health, health equity and environmental justice. This Rapid HIA considers the health impacts of a Municipal Public Access Plan developed by the City of New Brunswick, New Jersey that considers current conditions and opportunities and recommends improvements to public access to the Raritan River that borders the city.

### *New Brunswick Municipal Public Access Plan*

This Municipal Public Access Plan (MPAP) was developed in accordance with Coastal Zone Management legislation N.J.A.C. 7:7E-8.11 and in collaboration with the New Jersey Department of Environmental Protection (NJDEP). The development and implementation of the MPAP supports the policy of local determination of public access locations and facilities, while safeguarding regulatory flexibility and potential funding opportunities for the City of New Brunswick. The MPAP will be incorporated into the municipality's Master Plan, in accordance with the Municipal Land Use Law (N.J.S.A 40:55D). The MPAP, as an official component of the municipal Master Plan, informs and/or identifies public access requirements associated with any proposed development or redevelopment project. The MPAP consists of an inventory of public access locations, and also includes plans to preserve and enhance access based on community needs and State standards.

Development of the MPAP and associated Coastal Vulnerability Assessment can focus this City's attention on improving public access and recreation, promote cleaning up and reusing underutilized lands, restore and protect important habitat through stewardship of Raritan environs and do all with an eye to balanced economic redevelopment for the City and its residents.

The overall goal of the MPAP is to establish the City of New Brunswick's plan to maintain and enhance all existing public access locations to and along tidal waterways and their shores.

### *The Raritan River and the City of New Brunswick*

The Raritan River comprises the entire northern boundary, approximately 4.5 miles in length, of New Brunswick. It impacts the city in many ways. On the positive side, the City was founded here in part because of commerce that flowed upstream from Raritan Bay to the City's shores and then later, between

the Raritan and Delaware Rivers through the canal and lock system that terminates in what is now Boyd Park. Also, the River brings beautiful scenery and abundant wildlife to the city, along with opportunities for boating, fishing and strolling along the water's edge. The economic potential of day-users of the River environs to surrounding towns and counties is not insignificant. People coming to recreate on or along the river will spend money for food and supplies and will stop in local shops and restaurants. On the negative side, it floodwaters have spilled its banks to block the major transportation artery and inundate many residents' homes. It poses a constant threat for drowning and water-related accidents.

One of the goals of the MPAP, along with other efforts underway in the region and at Rutgers University, is to increase awareness, knowledge and a sense of commitment of New Brunswick residents to increased public access and recreational use of the River. The idea is that when more people are enjoying outdoor experiences that include boating or fishing on the river, or walking or biking on trails alongside the river, it increases public support for those areas of the City and helps keep the river as clean and healthy as possible and retaining scenic values.

### *New Brunswick – A Snapshot*

New Brunswick, NJ is located in central eastern New Jersey and serves as the county seat of Middlesex County. New Brunswick is close to six square miles in size, and includes 272 acres of parks, recreation areas and open space (including playgrounds, passive areas, athletic fields, facilities, lawns, and gardens.). The 2010 population was 55,181,<sup>1</sup> for a population density of approximately 14.89 people per acre. Daytime population, which includes employees of two major hospitals, corporations and Rutgers University, is over 70,000. During the college semesters, students add another 40,434 to the region.

New Brunswick is a city with many varied health needs stemming from its industrial past, aging infrastructure and housing stock, and a population with high levels of poverty, low education levels, and a large foreign-born segment. New Brunswick is diverse with a population breakdown of approximately 45% white, 16% Black or African American, 1% Native American, 8% Asian and 25% from other races. Hispanics or Latinos of any race account for approximately 50% of the population. Spanish is spoken at home by 45.5% of the population (U.S. Census, 2010). A more detailed set of socioeconomic data is found in the Baseline Assessment section below.

### *Health Impact Assessment Process*

Health Impact Assessments (HIA) provide a systematic method for evaluating a policy, program, or project's potential effects on the health of a population, and the distribution of its effects within the population. Quantitative, qualitative and participatory data are used to help evaluate potential health effects of a proposed or sometimes completed project. An HIA is prospective in nature, evaluating impacts prior to an intervention to enable decision-makers in fields traditionally not connected to the health sector like transportation, public works and land use, to incorporate health decisions on a project as or before it evolves. An HIA's recommendations build on its assessment of health projections and are designed to increase positive health outcomes and minimize adverse health outcomes.

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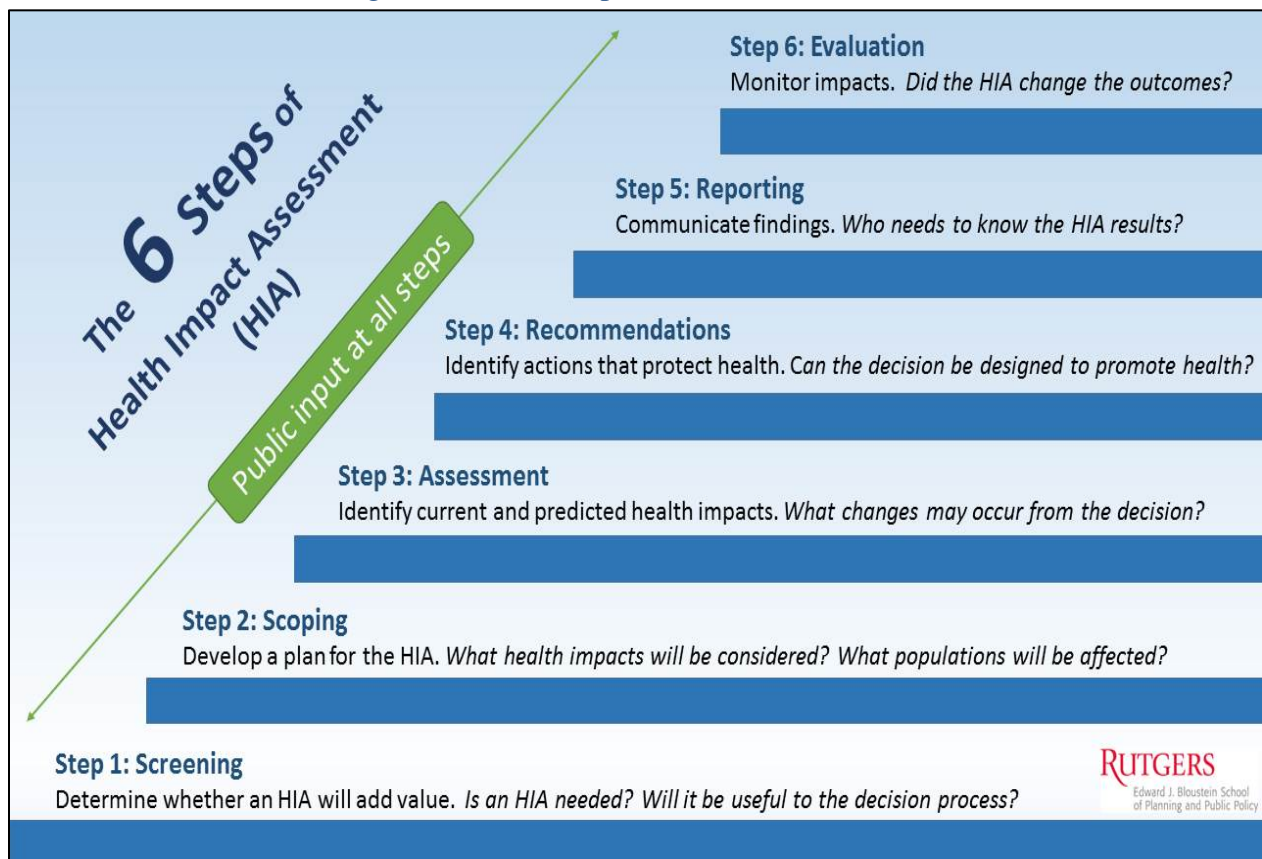
<sup>1</sup> <http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=bkm>

In comparison with more comprehensive HIA efforts, this HIA is not as extensive and is therefore referred to as a “rapid” HIA. In particular, this HIA does not incorporate an extensive public participation element, with most of the analysis conducted via “desktop” methods of literature review and analysis of secondary data. With a limited amount of research time, this HIA is intended primarily to identify key health issues and provide general guidance related to health impacts. Additional resources would be necessary to conduct a full study that engaged multiple methods of community involvement and collected new primary data to make the analysis much more specific and detailed to the environmental, social and economic context of this target population.

HIAs consider a range of social, environmental and economic influences on health and place an emphasis on identifying groups who might be particularly vulnerable or disproportionately impacted. Health inequity is an important focus of an HIA assessment, meaning that it is important to describe vulnerable populations that are disadvantaged when it comes to access to healthcare, lifestyle or neighborhood factors that affect their health and well-being. Examples of populations that can be considered socially disadvantaged include individuals living in poverty, females, and/or minority groups (Braveman & Gruskin, 2003)

Health Impact Assessment follows a six-step method (screening, scoping, assessment, recommendations, reporting, monitoring/evaluation) that results in a set of grounded recommendations intended to maximize positive health aspects and minimize negative impacts to health. Each will be described briefly in the sections below.

Figure 1. Health Impact Assessment Process



Because this is a rapid HIA, we have adapted the six steps to the context of a shorter timeframe and fewer resources. Specifically, as mentioned above, public input was limited to two public meetings and a small-scale survey, and although all steps were performed, they did not involve new data collection or rigorous analysis, but rather focused on identifying key health factors and providing support and evidence for findings and informed recommendations to integrate health into the MPAP process.

#### **Goals for this HIA:**

- Outline the anticipated positive and negative health impacts of the major recommendations of the New Brunswick Municipal Public Access Plan regarding maintaining and improving access to the Raritan River.
- Provide informed recommendations about how to maximize positive impacts and minimize negative impacts to health.
- Increase understanding among decision-makers and community residents of the relationship between health and the built environment.
- Build capacity and interest in future HIAs in the New Brunswick, NJ area.

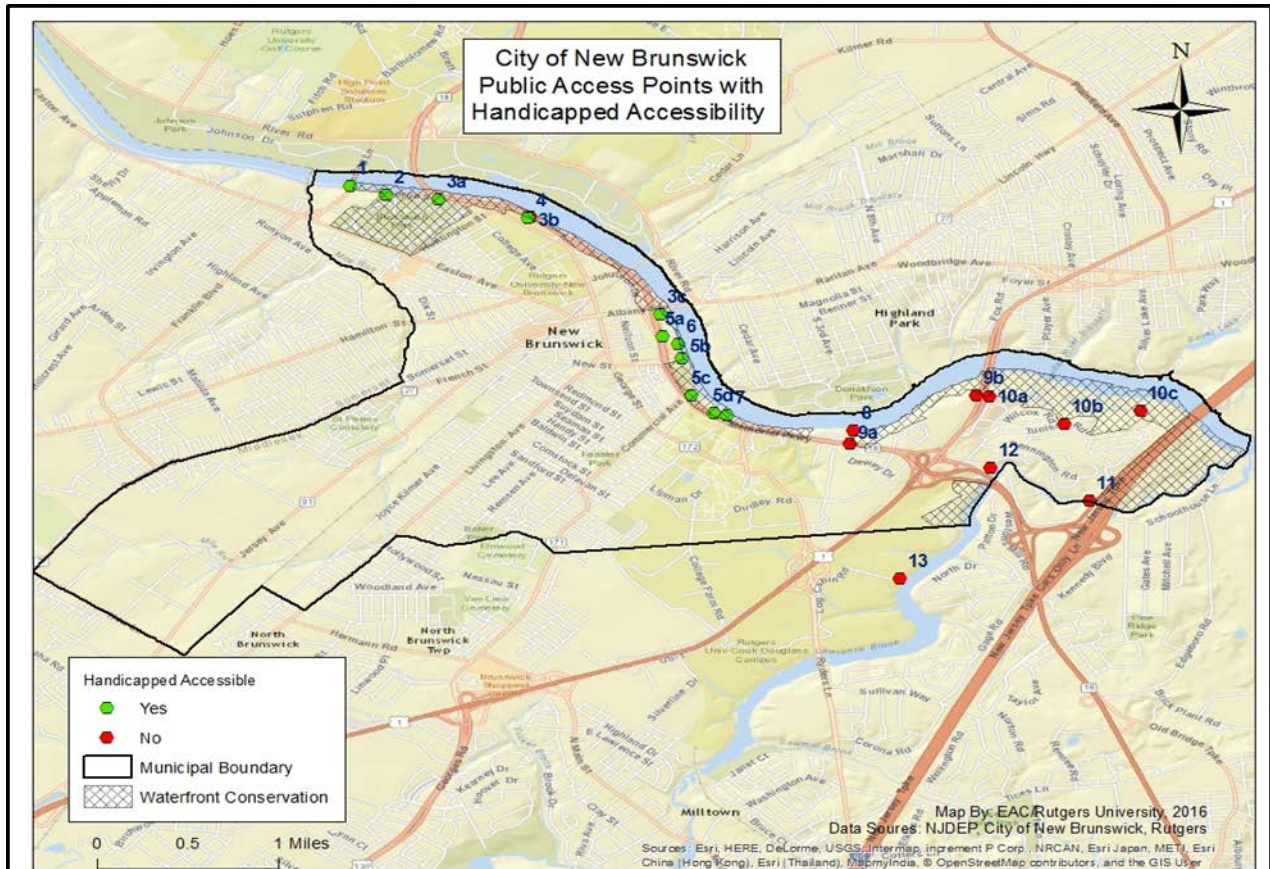
#### ***Current Public Access to Raritan River***

Although the waterfront area is extensive in New Brunswick, the space is underutilized, including the existing Boyd and Buccleuch Parks. Public access is fairly limited, however, and mostly restricted to:

- **Bikeway/Walkway** - A short section of the D&R Canal, the Route 18 Trench Bikeway and Boyd Park offer several miles of linear bikeway/footpaths.
- **Boyd Park** – Waterfront park includes access for fishing, birdwatching, a concrete boat launch, restrooms and portable toilets, parking, picnic tables, picnic pavilions, benches, seasonal day-time boat dock, playgrounds, an historic canal and lock, historic and informative signage, and a festival/concert area with an amphitheater.
- **Conservation Areas** - Located to the east of Boyd Park, this unimproved area offers bird watching, views of the river and some shoreline fishing opportunities.

(See Map 1) The City’s plan is to improve and expand public access, especially by promoting use of existing parks, potentially connecting them along the river with a system of trails. Part of the waterfront conservation area is characterized by steep slopes (greater than 10% grade) down to the river – effectively limiting development along the shoreline. But it is possible to walk along the Raritan along most of the riparian boundary of the city.

## Map 1 Public Access Points



Starting from the west, access is provided at Buccleuch Park by crossing a road to get to a narrowed paved walkway with fencing between it and river’s edge, called the “trenchway” that runs between Buccleuch and Boyd Park. Next (points 3b and 4 on the map above) is county-owned Deiner Park that has stairway access to the trenchway that is normally locked. The next cluster of access points are located at Boyd Park, the only truly waterfront public park in the City that is connected via a pedestrian overpass over Route 18 for a 5-7 minute walk to New Brunswick’s downtown commercial district and nearby neighborhoods. Then, farthest east or downriver, is the county-owned “River Conservation” area between Route 1 and Route 95 referred to as the “Raritan River Conservation Zone.”

Boyd Park, features a 3/4 long mile tow path [that was part of the historic Delaware and Raritan Canal] with lights as well as an historical swing bridge, canal, and locks. Another element of this park is New Brunswick Landing, a free 24-slip floating dock open seven days a week between Memorial Day and Labor Day. This park also supports an amphitheater and public facilities. Extensive historical signage has been installed to help visitors learn about the history of the Raritan River and the City of New Brunswick. This park hosts festivals and special events including the Raritan River Festival, Hispanic Festival, and

the City’s 4th of July Celebration. Boyd Park has been severely damaged by tidal surge, wind and flood waters in severe storms of the past decade.

**Table 1**  
**New Brunswick Parks**

Park	Acres	Amenities	Neighborhood/Location
<b>Boyd Park (City)</b>	18.82	Festivals, special events, ¾ mile tow path, canal, historic swing bridge, locks, historical signage, view of skyline & river	Between River and Route 18
<b>Bucleuch Park (City)</b>	74.38	Historic site, athletic fields, 1.5 mi cc/fitness trail, playground, rock garden, flower garden, gazebo and picnic pavilion	Between Raritan River (road crossing necessary) & Easton Avenue
<b>Denier Park (County)</b>	3.63	Basketball courts	Edge of College Ave. Campus between George St. and River Trenchway

**Map 2. New Brunswick Waterfront Parks**



- 1 = Buccleuch Park (City)
- 21 = Deiner Park (County)
- 3 = Boyd Park (City)
- 22 and 23 = Conservation Areas (City and County)

***Summary of MPAP Goals and Priorities***

The HIA will assess human health impacts that could arise as the MPAP is adopted and implemented, and that should be considered in decision-making as the goals and priorities are pursued. Those key goals and associated activities relate to both maintaining public access and also enhancing and improving access facilities and quality:

**Maintain Existing Public Access :**

It is a goal of the MPAP that the City, County, Rutgers and other stakeholders will continue to preserve and maintain existing public access locations. The priority is to ensure that existing public access points



are safe and accessible, and respective of coastal vulnerability concerns and associated impacts on city property, public access assets and the health and safety of city residents, work force, and visitors.

Some of the maintenance explicitly planned includes:

#### Delaware and Raritan Canal State Park Trail

Improved signage to direct potential users to area parking, facilities and directions to other city public assets, as well as to indicate that the section going south from Landing Lane is presently a dead end.

#### Route 18 Trench Bikeway

- Work with Rutgers to open access from Deiner Park for safe egress from the bikeway and improve use
- Manage vegetation, graffiti and trash along the length of the bikeway to enhance views of the river
- Work with local NGOs such as the Lower Raritan Watershed Partnership or the Central Jersey Stream Team to do periodic cleanups of the river banks on the Raritan side of the bikeway fence
- Install signage at entrances to the bikeway with information about length and egress and directions to other public assets
- Ensure adequate and maintained lighting at the Albany Street end of park and as needed throughout the bikeway
- Improve access to the bikeway entrance from Buccleuch Park to ensure safe crossing of George Street (presently no curb cut)

#### Boyd Park

- Manage and replace vegetation as needed to enhance views of the river
- Empty trash cans and clear vegetation to improve sightlines and attractiveness along canal paths
- Install more benches along paths especially in the New Street end of park
- Install fishing line disposal containers
- Install picnic tables at the northern end of the park near New Street and investigate placement of additional pavilions and barbecue stations in the park
- Improve awareness of Boyd Park from downtown New Brunswick by installing directional signage at the city side of entrances and entrance ramps at Albany Street, New Street, Commercial Avenue, and George Street, as well as at other locations such as near restaurants and theaters and the train station
- Improve access to parking through placement of signage within the park to nearby parking amenities and by expanding available parking in the north end of the park
- Repair and/or replace lighting along the towpath
- Work with the D&R Canal Commission, the D&R Canal Watch and others to restore the terminus canal lock and improve educational/historical signage
- Continue to maintain paths throughout the park

#### New Brunswick Landing Boat Dock

- Work with the county to continue to maintain the docks and channel markers and as feasible expand the season to accommodate boat passenger access to the park, university events, and downtown activities

- Install signage to other nearby public access and directions to the boat launch in the southern end of Boyd Park

#### Planned Enhancement to Public Access Locations and/or Facilities:

The second major goal of the MPAP is for the City to work with the county, Rutgers University and other area stakeholders to develop new access points or enhance existing facilities. These consist of two primary initiatives:

##### Raritan River Boardwalk and Pedestrian/Bicycle Bridge to Piscataway

- In its 2030 Facilities Master Plan, Rutgers has proposed rebuilding the Route 18 Trench path by constructing a boardwalk in the Raritan River – similar to the Schuylkill River Boardwalk – that reconnects the D&R Canal Trail through this area and to the remnants of the canal towpath in Boyd Park. This new path would be wider, more open, and would have a new open access to Deiner Park that would also connect to a new pedestrian and bicycle crossing of the Raritan River into Piscataway. Reconnecting the bikeway to the D&R Canal Trail and with a Raritan crossing into Piscataway would likely increase the number of visitors to Boyd Park and possibly bring more visitors into downtown New Brunswick.

##### Raritan River Conservation Trail

- Create improved access into and trails through the conservation areas east from Boyd Park to the confluence of the Lawrence Brook and Raritan Rivers. It is expected that this area will have few amenities other than trails, signage (directional as well as interpretive) and associated parking. The conservation areas are within the Raritan’s floodplain. As such, the trail designs and access plans will need to accommodate periodic inundation. Access to the conservation lands will require collaboration between the city and Middlesex County.

#### Limitations and Challenges to Public Access

Public use of New Brunswick’s Raritan River access areas is constrained by temporary or more permanent restrictions.

Some of those are:

- limited parking
- inadequate signage
- lack of or insufficient restrooms
- excessive noise
- unpleasant environmental conditions
- safety concerns – real or perceived
- lack of amenities, such as seating and picnic facilities, that would attract users
- trash or under-maintained features, such as path lighting and overgrown vegetation
- seasonally or hourly use restrictions
- zoning restrictions
- physical constraints

Specifically, some of these restrictions are evidenced in the following areas:

## Delaware and Raritan Canal State Park Trail

The portion of the canal heading south from Landing Lane Bridge dead-ends at the large spillway adjacent to the city's main water intake. Public access is restricted here by the spillway and water utility structures. There is no signage at the Landing Lane entrance to this spur to indicate that it is not a through path.

## Route 18 Trench Bikeway

- The 1.4 mile long path is bounded on the river side by a tall chain link fence, and on the landward side by the embankment for busy Route 18. There is a gated entrance at the back of Deiner Park behind Rutgers' Hardenburgh and Campbell Halls off George Street. This entrance, at the top of pedestrian bridge and stairs that leads down to the bikeway, is presently locked and poses a potential hazard for visitors needing emergency egress from the bikeway. Other exits from the bikeway are 0.6 miles to the north, or 0.8 miles to the south of this point.
- This limited egress coupled with restricted sightlines, the narrow path, graffiti, periodically overgrown vegetation and seasonal homeless encampments along the route cause users and potential users of the bikeway to perceive it as unsafe.

## Boyd Park

- Despite recent park improvements, Boyd Park is perceived as poorly accessible by area residents and faces several restrictions that inhibit more active use of the park including limited parking, lack of signage to direct visitors to the park, limited amenities, degraded features, and seasonal/periodic flooding.
- Street crossings to walk to the park from downtown neighborhood, though recently improved, are still perceived to be dangerous as there are no barriers between the pedestrian walkways and traffic exiting and entering Route 18 via Commercial Avenue and New Street – the main pedestrian entrances to the park. Further, there is no signage at the city-side entrance to these access roads indicating that they provide park access.



Boyd Park, with inundation caused by Hurricane Irene.<sup>1</sup>

- One of the more significant concerns for Boyd Park is that the river periodically inundates the park. Part of the natural floodplain of the Raritan, Boyd Park floods at extreme high tides, during storm surges, and during high precipitation events in the upland regions of the river basin, damaging park infrastructure
- A further area that detracts from enjoyable use of the park is the condition of the remaining section of the D&R canal. The section within Boyd Park is cut off from the feeder canals and receives only limited flushing from Raritan overflows or rain events, therefore sometimes getting stagnant and filling with trash.

## New Brunswick Landing Boat Dock

- Limited hours of operations and insufficient marine-type amenities probably impede use of the dock.

## Raritan River Conservation Areas – City and County

- The primary restrictions are the lack of improved access points and no linkages to other public access in the city. A potential public access point off of Regency Center Drive is gated and locked, as is potential egress from the south portion of the area off of the PSEG service road just north of the NJ Turnpike. Parking, signage, maps, or associated amenities such as benches or toilets are also lacking and should be considered as plans for opening a path through the conservation areas are developed.
- Also, the conservation areas are in the flood plain of the Raritan and would be inundated during high flow and some high tide events.

## II. SCREENING

During the screening phase of an HIA, the proposed policy, plan or program is reviewed to determine if it is a strong candidate for an HIA. Criteria include feasibility, ability to inform the decision, and availability of both a sufficient timeframe to conduct an HIA and evidence related to the potential research questions.

As a “Desktop” HIA, this assessment may have less rigorous feasibility criteria. For example, while it is always important to have sufficient research-based evidence to support potential impacts, in the case of a desktop HIA, this evidence should already be published and preferably in the form of a systematic literature review or a rigorous program evaluation.

Common questions asked during this step may include: What project or decision will the HIA address or inform? How important to health is the project or decision, and will the HIA provide new and important information to inform decision-makers? Is a HIA feasible given available resources?

### *Identification of Decision and Decision-makers*

The decision point for this HIA is adoption of the MPAP by the New Brunswick City Council. The HIA findings and recommendations will be incorporated and referenced within the plan and are dovetailed, where relevant, with recommendations in the plan. So the HIA provides additional support and also an added focus on health impacts that decision-makers will have at their disposal as they consider adoption of the MPAP and begin to carry out its implementation.

Follow-up decisions about how to implement recommendations of the MPAP are also decisions that will be influenced by the HIA. Other key decision-makers are Middlesex County, D and R Canal Commission and Rutgers University, organizations of which own or manage properties adjacent to the River. The New Jersey State government will also play a role in some future development or conservation-related decisions.

Research team members determined that this decision context presented an appropriate opportunity to conduct an HIA and that decision-makers would accept its findings as a source to inform decisions.

### *Importance of Health*

Familiarity with many other HIAs conducted on projects with some of the same elements that relate to public access to waterways was enough to lend evidence to the presumption that a public access plan affects human population health. The research team advising the project (EAC and VTC staff), through expert knowledge and prior research, concluded that public access to waterways could affect numerous factors that have an ultimate impact on health outcomes. Some of these are issues related to water safety and associated injuries, personal safety related to perceived crime, potential for recreation and outdoor activity that affects fitness and mental health, potential for social interaction through events and venues that facilitate it, and potential generation of economic benefits that translate into jobs and revenues that can result in healthier families.

Further, as a simple census analysis and prior work on City projects reveals, New Brunswick clearly has a large disadvantaged population that is relatively poorer with lower education levels and higher immigrant populations. This means that another important factor in HIA studies, that is, the distribution of benefits with a focus on special populations with disparate impacts, is something that is definitely important and relevant to this HIA.

### *Available Resources*

Rutgers Bloustein School's Environmental Analysis and Communication (EAC) received support from the Voorhees Transportation Center at Bloustein for approximately 20 days of staff time to complete this HIA. This amount of staff time was sufficient to conduct the analysis of mostly secondary information necessary for this HIA and to produce this report.

Other efforts provided complementary research and support for this study, including the efforts of another EAC staff member who was supporting the City's MPAP project. Some aspects of the HIA study, carried out roughly simultaneously with the MPAP development, could be conducted jointly with this funded project. For example, a desktop HIA usually has no stakeholder engagement due to time and resource constraints. But in this case, a meeting of a special committee of the New Brunswick Environmental Commission that was already formed to assist with the MPAP served as a forum for presentation of preliminary findings and an opportunity for some limited public input. Another example is the public survey that included some questions intended to inform the HIA and others important for support of the MPAP findings and priorities. A single survey was designed to meet both purposes.

Also, a vulnerability assessment conducted for the City by \_\_\_\_ just prior to this study also provided an overview of the community's potential exposure to future storms and sea-level rise, and a list of projects and strategies that are intended to help the City become more resistant to future storms and flooding. The HIA could use some of the components of this vulnerability assessment to inform findings and recommendations.

### III. SCOPING

Scoping establishes the foundation for designing and conducting the Health Impact Assessment. During this step, the HIA investigator identifies: research questions; health determinants and pathways that should be considered; affected geography and population(s) that should be evaluated; and methods to be used to undertake the assessment. During the scoping phase of a desktop HIA, readily available experts can be consulted, but there is no effort to conduct stakeholder engagement to provide input to scoping steps.

#### Research Question:

The overarching research question guiding the HIA is:

*What are the physical and mental health outcomes associated with existing and enhanced public access to the Raritan River in New Brunswick, NJ, as contained in the Municipal Public Access Plan document?*

Health determinants are personal, social, economic, and environmental factors that are influenced by societal decisions and ultimately affect the health of individuals or populations. Health determinants are linked through research to health outcomes, such as life-expectancy, disease and injury rates.

Four sub-questions address the specific determinants, or ways that health may be impacted, by aspects of public access, and they include:

- How could safety issues related to both accidents and to criminal activity, impact health?
- How could more opportunities for outdoor activity related to public access impact health?
- How could more opportunities for social interaction related to public access impact health?
- How could local economic activity associated with public access impact health?

The table below lists possible health impacts expected to be associated with each sub-question based on initial scans of literature and brief consultation with other researchers. The table also suggests indicators and sources of data consulted to collect information relevant to the research question during the assessment phase. Indicators were selected because they are either data that are readily available through existing secondary sources, or information that could be collected at either an exact or approximate level through new primary data collection (e.g. survey).

Table 2. Research Questions, Indicators and Data Sources

Research Questions	Possibly Related Effects and Health Outcomes	Indicators	Data Sources (Potential, but not all available)
<i>How could SAFETY ISSUES related to both accidents and to criminal activity, impact health?</i>	Chronic stress Acute stress Anxiety and fear Injury or death	Poor Mental Health days Self-reported stress and fears Reported injuries Emergency Medical and Rescue Data Hospitalizations	<b>Baseline:</b> Local health depts, BRFSS <sup>1</sup> , local hospitals and doctors, EMS, police, Resident survey <b>Projection:</b> Literature Review, Experts
<i>How could more opportunities for OUTDOOR ACTIVITY related to public access impact health?</i>	Stress and anxiety Depression Obesity Hypertension Heart disease Asthma/Respiratory Gastrointestinal Diseases	Obesity Statistics Poor Mental Health Days Poor Physical Health Days Morbidity measures Hospital Visits Self-reported stress Animal encounters	<b>Baseline:</b> County Health Rankings, BRFSS, Community Health Assessments (if available), Local health depts. Mental health hotline <b>Projection:</b> Resident Survey, Literature Review, Experts, Local
<i>How could more opportunities for SOCIAL INTERACTION related to public access impact health?</i>	Stress and anxiety Depression Addictions Domestic violence	Self-reported Ratings of Quality of Life Membership in Local Service or Civic Groups Poor Mental Health Days Poor Physical Health Days Self-reported stress	<b>Baseline:</b> Community Health Assessment (if available), County Health Rankings, BRFSS, Mental health hotline, Local health depts., Resident survey <b>Projection:</b> Literature Review, Experts, Resident Survey
<i>How could LOCAL ECONOMIC ACTIVITY associated with public access impact health?</i>	Stress and anxiety Depression Addictions Domestic violence ED visits Incidence of preventable disease	HH Income Property Values Tax levels Household Wealth Employment Quality of Life Use of Preventive Services	<b>Baseline:</b> County Health Rankings, BRFSS, Local Health depts, Resident Survey, Local Economic Development Organizations <b>Projection:</b> Literature Review, Resident Survey, Cost/Benefit analysis, Property value projection analysis

<sup>1</sup>Behavioral Risk Factors Surveillance Survey, CDC (<http://www.cdc.gov/brfss/>)

### Key Health Issues and Pathways

Causal models, or pathway diagrams, are used in HIAs to define cause and effect relationships between health determinants and health outcomes. Pathway diagrams help organize existing knowledge and research, guide analyses, and communicate information in a clear and systematic manner. Figure 1 shows a general pathway diagram template.

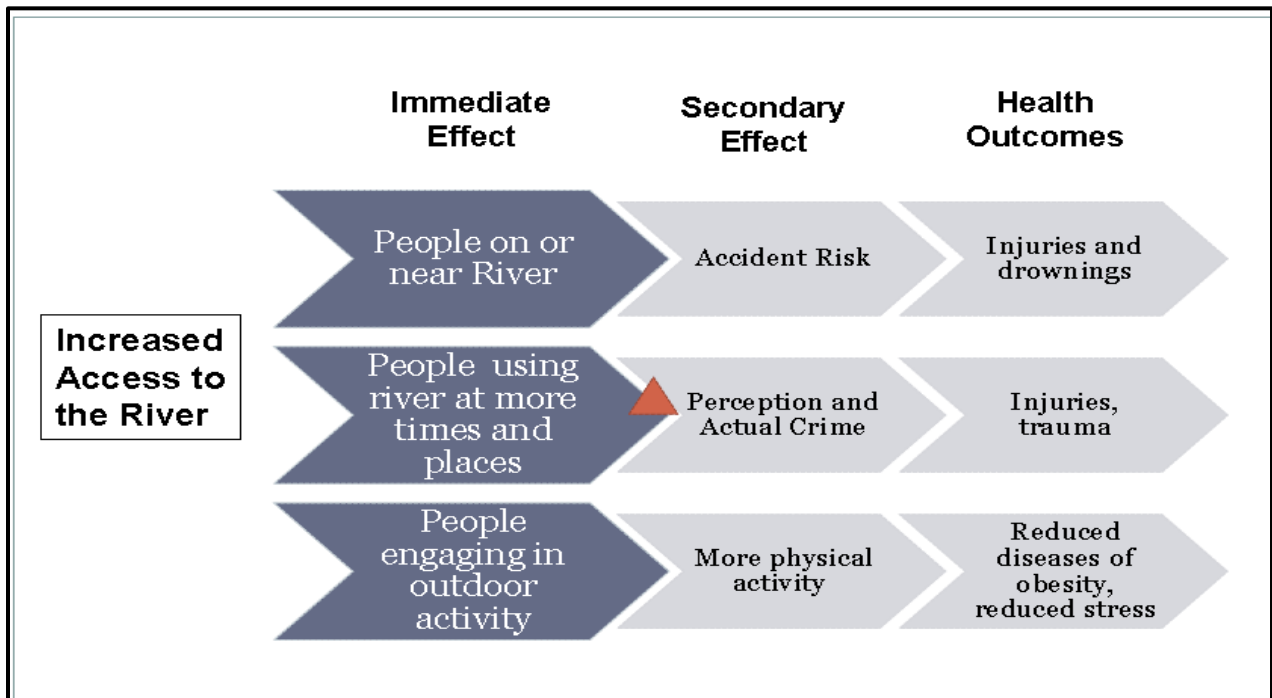
Figure 1. Health Pathway Model



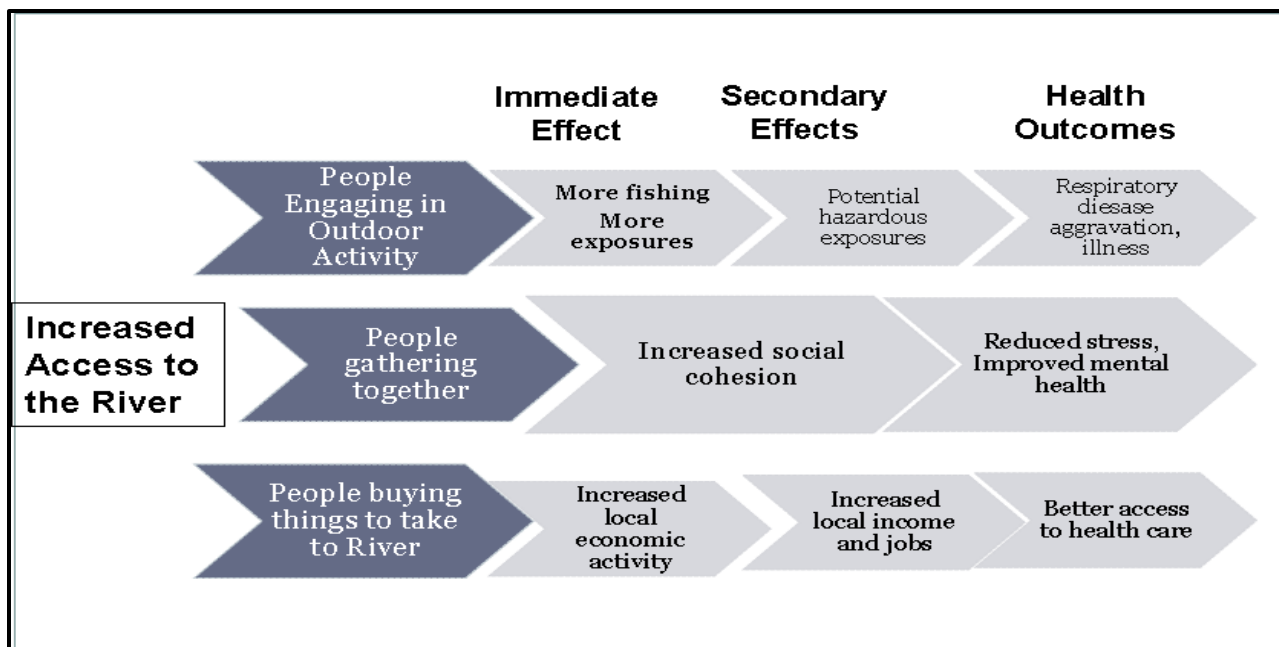
The following two figures show constructed pathway analyses of health determinants and projected impacts associated with the public access plan.

“Public Access” for the purposes of the HIA will refer to access to both getting onto the River itself (boating, kayaking) and also to locations directly along or at the River (walkways, picnic areas, other riverfront amenities). So the quality of “access” means that people may be either directly getting on or off the water, or they may be close enough so that the River is the primary feature or backdrop scenery of their visit and activity, whether it is taking a stroll or simply sitting and watching the water.

Figure 2. Health Pathways of Increased Public Access







### *Study Boundaries and Affected Populations*

For the purpose of this HIA, the geographic boundary is the New Brunswick city boundary and the affected population of the MPAP will be more than 100,000 people, including the entire city population of New Brunswick, plus daily employees who might access the River over lunch breaks or after work, and also Rutgers students (at peak during semesters). The most impacted, however, would be those who live or work within a reasonable walking distance, or .5 mile from the water's edge. This includes almost all of the Rutgers campus population, the largest corporation (Johnson and Johnson) and also St. Peter's Hospital.

### *Vulnerable Sub-Populations:*

New Brunswick's resident population is significantly poorer, less educated and more likely to rent than the county as a whole. (See Table \_\_). In terms of populations that are typically impacted disproportionately by factors influencing their health, the most vulnerable in New Brunswick are those of lower income and those of Hispanic and/or immigrant status.

Studies also show that park access is often unequal across socioeconomic groups, contributing to negative health impacts on the underserved populations. Particularly, research has shown that these underserved populations tend to be minority and/or of lower economic status (Gordeon-Larsen, Nelson et al, 2006; Huston, Evenson et al, 2003; Parks, Houseman et al, 2003)

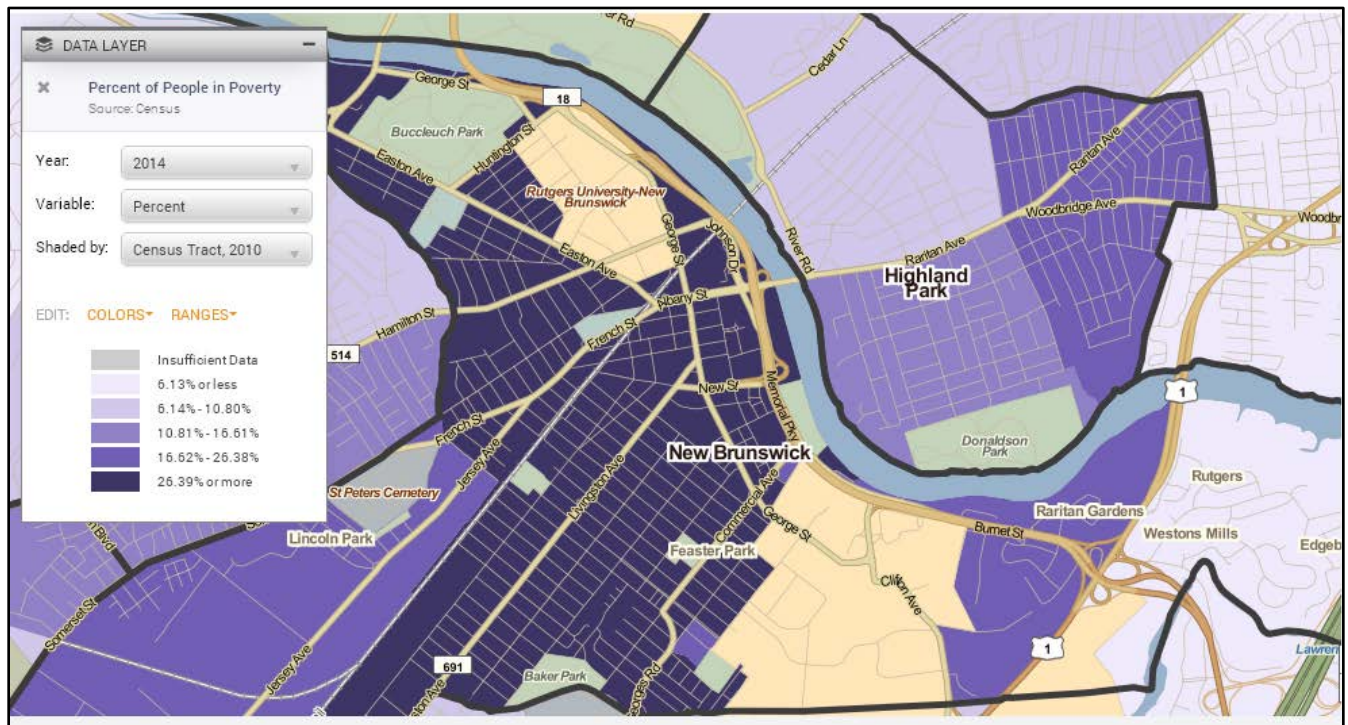
Table 3.  
Selected Socioeconomic Statistics, New Brunswick and Middlesex County  
(American Community Survey, 2009-2011)

	New Brunswick	Middlesex County
<b>Median household income</b>	\$39,878	\$77,311
<b>Percent of all persons below poverty level</b>	30.9%	8.2%
<b>Education – 12<sup>th</sup> grade or less, no diploma</b>	33.4%	11.2%
<b>Home ownership rate</b>	24.6%	66.3%

Source: US Census, 2012

Map 3 shows that much of the non-University area of the city has high poverty levels, and that census tracts closest to existing public access areas near and around Boyd and Buccleuch Park and the D and R Canal have levels of poverty over 26%.

Map 3.  
Percent of People in Poverty by Census Tract



Source: PolicyMap

ii. Lower Income Populations and Health

Socioeconomic status is one of the most established determinants of health. For example, research shows that lower birth-weight babies, who are often born to lower-income mothers, are more susceptible to

chronic conditions such as asthma, heart, and digestive disorders. Children in lower-income families are also around seven times more likely to be in poor or fair health compared to their counterparts in families with incomes at or above 400 percent of the federal poverty level. In general, lower-income adults report fair or poor health and are more likely to suffer from chronic illnesses (7 – Studio Report). Further, a 2012 Gallup poll found that impoverished Americans are more likely to say they have been diagnosed with depression. A 2009 study showed large health disparities between life expectancy in short geographical distances. For example, babies born to mothers in Montgomery County, MD, and Fairfax and Arlington Counties, VA, had life expectancies six to seven years longer than comparable babies in Washington, DC.(9 – studio report)

### *Hispanic Ethnicity, Immigrant Status and Health*

Hispanic or Latino residents are another underserved population that experiences pronounced health disparities. According to the CDC's 2013 Health Disparities & Inequalities Report- United States (CHDIR), health disparities prevalent in Hispanic populations include obesity, diabetes, periodontitis, and HIV. Hispanics are 15 percent more likely to be obese, 65 percent more likely to have diabetes, and twice as likely to suffer from asthma than non-Hispanics. Hispanic populations have also been found less likely to control their blood pressure, receive colorectal cancer screenings, and get influenza vaccinations. Hispanic health is also affected by language and cultural barriers (17-Studio Report). Hispanics are less likely to have health insurance coverage (18-Studio report).

### **Methods of Analysis:**

The methods of analysis in this HIA included a literature review, collection of secondary data, a resident survey, and limited public engagement. Each is described below.

### ***Literature Review***

Literature review is critical to make the connection between the indicators and the broader questions about health determinants and projected outcomes. Qualitative assessment of health impacts in an HIA refers to consensus derived judgments about the relative magnitude, severity, likelihood and/or distribution of health impacts of plan/project components. Most HIAs use literature reviews of quantitative and qualitative studies of exposures and outcomes related to research questions to inform their characterizations of health impacts and their recommendations, and use best judgment about the relative importance of the impact. In a desktop HIA, the literature review step can be expedited by utilizing prior reviews conducted for similar studies, and consulting websites like County Health Rankings and Roadmaps and Active Living Research as possible resources since they have already made the connections between specific determinants and health.

In this HIA, the research staff relied heavily on both previously conducted and newly researched literature in the projection assessment phase, reviewing empirical research from scholarly journals to find evidence of connections between various proximate and intermediate effects and final health outcomes.

### ***Secondary Data Collection***

US Census data was the primary source used to conduct the baseline demographic and socioeconomic analysis. For health data, data sources included the CDC's Behavioral Risk Factor Surveillance System

(BRFSS) which collects data on health-related risk behaviors, chronic health conditions, and use of preventive services; and County Health Rankings and Roadmaps<sup>2</sup>, which weighs and summarizes over twenty sources of public health data from national sources.

### Survey

The HIA research included an online survey for residents, and also included review of results of other recent surveys in the area that had a New Brunswick public access component. The New Brunswick Public Access research study was conducted on behalf of the City Of New Brunswick for the MPAP process, and thus provided an opportunity to include questions that would inform the HIA at the same time. The purpose of the research was to determine the public’s needs and concerns as they relate to access to and use of the parks and public spaces adjacent to the Raritan River. The Institutional Review Board-certified survey was anonymous and voluntary and was available on-line in English and Spanish. Links to the survey were distributed via email to representatives of local stakeholder organizations who pushed the survey to their membership. The 50-question survey was designed to take between five and 10 minutes to complete. It focused primarily on awareness and use of Buccleuch Park, Boyd Park, and Deiner Park and the three conservation areas – two along the Raritan (city and county owned) and one at Westons Mill Pond (not included as part of the HIA analysis).

A total of 73 residents of New Brunswick completed the survey.

The sample was older, less ethnically diverse, higher educated and higher income than the profile for the City as a whole. Over 45% of respondents were 55 years of age or older, with the largest percentage (42%) between 55 and 74 years of age. (See Table 4). The survey sample also does not reflect the racial composition of the area, as over 84 percent of the sample identifies as white, and only about 4 percent as Hispanic (Table 5). The respondent sample was significantly more educated than the city as a whole, with a vast majority (about 90%) having at least a bachelor’s degree (Table 6.), and more than 50 percent had household incomes more than \$100,000, with only 12 percent having incomes under \$50,000 (Table 7.).

Table 4.  
What is your age? (n = 73)

Answer	%
<b>Under 18</b>	0.0%
<b>18-34</b>	17.8%
<b>35-54</b>	37.0%
<b>55-74</b>	42.5%
<b>75+</b>	2.7%
<b>Total</b>	<b>100.0%</b>

<sup>2</sup> <http://www.countyhealthrankings.org/>

Table 5.  
What is the highest level of education you've completed? (n = 73)

<b>Answer</b>	<b>%</b>
<b>Some college</b>	5.5%
<b>Two-year college degree</b>	4.1%
<b>Four-year college degree</b>	27.4%
<b>Some graduate work</b>	12.3%
<b>Graduate degree</b>	50.7%
<b>Total</b>	<b>100.0%</b>

Table 6.  
Which group(s) do you most closely identify with? Select all that apply.

<b>Answer</b>	<b>%</b>
<b>American Indian and Alaska Native</b>	2.8%
<b>Asian</b>	0.0%
<b>Black or African American</b>	12.7%
<b>Hispanic or Latino</b>	4.2%
<b>Native Hawaiian or other Pacific Islander</b>	0.0%
<b>White</b>	84.5%
<b>Some Other Race</b>	2.8%

Table 7.  
What is your total annual household income? (n = 67)

<b>Answer</b>	<b>%</b>
<b>Less than \$25,000</b>	4.5%
<b>\$25,000 to \$49,999</b>	7.5%
<b>\$50,000 to \$99,999</b>	34.3%
<b>\$100,000 to \$149,999</b>	22.4%
<b>\$150,000 or more</b>	31.3%
<b>Total</b>	<b>100.0%</b>

### *Limited Public Engagement*

Although desktop HIA's do not typically have the time or resources to set up a formal stakeholder engagement process, it is advisable if at least some limited public input is obtained. Using the existing subset of the New Brunswick Environmental Commission that was already serving as an advisory committee for the MPAP was a time-saving way to obtain feedback, present findings and have a ready-made avenue for communication of findings.

For this HIA, preliminary findings from the assessment phase were presented at two different public meetings. One was a meeting of about 15 stakeholders associated with the MPAP advisory group, with the addition of several other interested local health and environmental representatives from the community, facilitated by the MPAP staff consultant. The other was a presentation for a group of more than 150 at an annual conference organized by the Sustainable Raritan River Initiative. In both cases, individuals from the audience provided reactions and feedback to a set of findings and recommendations, and this input helped to refine or add to the final set included in this report.

## **IV. BASELINE ASSESSMENT**

In the baseline assessment, health, social, physical and economic information about the existing context is collected. This information is then utilized to analyze the positive and adverse health effects of the proposed plan in the projection assessment phase (NRCN A, 2011).

The section will first briefly summarize existing and prior studies and plans that are relevant to the potential impact of the MPAP, and then presents background on current use of public access areas, and finally presents baseline health information for affected populations.

### *Current Context from Prior Studies and Plans*

These four existing studies and plans form a backdrop that is important to consider when assessing potential health impacts of the MPAP strategies:

#### *MyCampus Findings: Connecting Rutgers to the Region, the Raritan and the Community*

The MyCampus Findings survey was designed to capture input from faculty, staff and students that would help inform Rutgers facilities master planning processes. Over 5,500 people participated in the New Brunswick portion of the survey, and it solicited input on, among other things, recreational facilities and opportunities and open space. Some of the comments that related to public access issues included: the D&R “towpath is great for running, biking. Wish it were easier to park nearby”; Boyd Park is “my favorite place to run! I sometimes go as far as Busch and Livingston. More connecting footpaths are required between all the campuses!”; and, Boyd Park is “surprisingly quiet”. A primary conclusion of the survey was that opportunities for better open spaces and connectivity exist at all locations (campus centers in New Brunswick/Piscataway) and that improved access to the Raritan, including a bridge across the River through the Ecological Preserve near Livingston campus are also desirable.

#### *Improving Student Health through Active Recreation in Campus Design*

In the Spring of 2015, a public health intern with the Bloustein School conducted a series of interviews, student engagement sessions and a survey to capture student opinions on recreation in campus design (Patel and Lowrie, 2015). Among other things, this project explored what outdoor activities were preferred by young adults and perceived obstacles to active outdoor recreation as well as reactions to Rutgers’ concept plans for revitalizing Deiner Park and the Raritan River Boardwalk and pedestrian/bicycle bridge to Piscataway. Of students surveyed, 61.9% said they would most likely or definitely use the proposed walking path and bridge across the Raritan. When asked if the walking paths or availability of kayak/canoe rentals would increase their participation in physical activities, strong

majorities indicated that they would definitely engage in more outdoor activity if the paths were built. A variety of factors were deemed somewhat or very important in influencing students' decisions to use the new paths and included: that they are clean and well-maintained (82.5% somewhat or very important), that they are lighted (81%), that they lead to places with activities or programs (73%), the paths are patrolled by officers (74.2%), the paths are free of homeless or vagrants (82.6%) and that they could get to class faster [on the paths] than using the buses (82.%%). Safety, crime and weather (cold in winter) were the biggest concerns with using the proposed paths.

*The Park System of New Brunswick, New Jersey: Findings and Recommendations*

In its 2011 *Findings and Recommendations* report, The Trust for Public Land (TPL) reviewed parks, open space and recreation strategies city-wide and made recommendations for improving and better utilizing these assets in New Brunswick. In particular, the report noted that “the outstanding resource of the Raritan River is not fully capitalized” (p4) and that there are “still key opportunities where New Brunswick could score greater success by linking parks and, especially, by reestablishing an intimate relationship between the city and the Raritan River.” (p4) They also suggested that an “aggressive marketing campaign to promote use of the river could result in the need for increased access points. Moreover, there is no pedestrian or bicycle connection between New Brunswick and the Delaware and Raritan State Park’s canal trail. Finally, there is no safe and dedicated bicycle route between the two New Brunswick campuses of Rutgers University.” (p5)

*Rutgers 2030: Rutgers University Physical Master Plan, Volume 1: New Brunswick*

This master plan looks at Rutgers New Brunswick “as a natural ecosystem centered on the Raritan River,” and, among other things, explores enhanced bicycle and pedestrian access between the Livingston and College Avenue campuses via the proposed bike/footbridge across the Raritan, and a new boardwalk along the New Brunswick side of the River. The plan describes the walkway as “connecting the College Avenue and Douglass [campuses], [that] would be accessible from new and restored stairs and ramps from the river’s bluff, and will revive town, campus, and river connections severed by Route 18.” (p20). The plan says that the boardwalk “increases access to the river and connects two disconnected recreational areas within New Brunswick.” (p117)

*Current Use of Public Access Areas (from Survey)*

As indicated by data from our survey, Buccleuch Park currently has the most visitors, with about a third of respondents reporting that they visit this park at least once or twice a month. (See Table 8.) More than a quarter said that they had never visited Boyd Park, which is the only park with direct public access to the River.

Table 8.

How often have you used the following waterfront parks along the Raritan River? (n = 73)

Park	Never	1 or 2 times before	1 or 2 times a year	1 or 2 times a month	Once a week	2 to 3 times a week	Daily
<b>Buccheuch Park</b>	18.4%	28.2%	19.4%	22.3%	3.9%	5.8%	1.9%
<b>Boyd Park</b>	26.7%	24.8%	32.7%	10.9%	3.0%	1.0%	1.0%
<b>Deiner Park</b>	70.3%	15.8%	11.9%	2.0%	0.0%	0.0%	0.0%

Very few residents in our survey had ever visited the conservation areas to the south/east of Boyd Park, and only just over 10 percent reported visiting them at least once or twice a year. (Table 9.)

Table 9.

How often have you used the following open space areas along the Raritan River? (n = 72)

Location	Never	1 to 2 times before	1 to 2 times a year	1 to 2 times a month	Once a week	2 to 3 times a week	Daily
<b>City Open Space - Raritan River Conservation Area (#22 on map above)</b>	79.2%	9.7%	8.3%	2.8%	0.0%	0.0%	0.0%
<b>County Open Space - Raritan River Conservation Area (#23 on map above)</b>	79.2%	9.7%	8.3%	2.8%	0.0%	0.0%	0.0%

For Buccheuch and Boyd Parks, we asked about the most important factors for using the parks, methods to get to the parks, and activities while at the parks. Results are shown in the Tables 10 - 15 below. Some of the interesting differences are that the distance from home and the recreational amenities are more important reasons for people to visit Buccheuch than Boyd Park. Programmed activities are much more important at Boyd, and social amenities like grills and shelters are not particularly important priorities at either park. Even though distance from home was an important factor for Buccheuch, visitors reported using cars more than visitors to Boyd and walking to the park less often. Public transportation was not used by any of our survey sample to visit these parks.

For both parks, attending an event, fitness and viewing scenery were the top three things that people reported doing in the parks, but attending at event was a stronger reason at Boyd Park. Although the survey was not a representative or large sample, these finding bear out other observations and informal discussions with stakeholders that suggest that Boyd Park’s amenities are under-utilized and that the park could attract more people for multiple uses if it were more accessible and offered more to all types of users.



Table 10.

For Buccleuch Park, what are the three most important factors you consider when you decide whether or not to use this park? (n = 62)

<b>Answer</b>	<b>Priority 1</b>	<b>Priority 2</b>	<b>Priority 3</b>
<b>Distance from my home</b>	22	8	3
<b>Natural scenery</b>	8	14	11
<b>Recreational amenities (like playgrounds or exercise equipment)</b>	6	12	12
<b>Security / safety</b>	5	12	9
<b>How easy it is to get there</b>	9	7	11
<b>Weather</b>	8	6	7
<b>Programmed activities</b>	7	6	2
<b>Social amenities (like grills, covered shelters, bathrooms)</b>	0	3	8

Table 11\_.

How are you most likely to get to Buccleuch Park? (n = 68)

	<b>%</b>
<b>Walk</b>	17.6%
<b>Bicycle</b>	8.8%
<b>Car</b>	70.6%
<b>Public Transportation</b>	0.0%

Table 12.

For what purposes do you use Buccleuch Park? (n = 59)

<b>Question</b>	<b>Often</b>	<b>Sometimes</b>	<b>Rarely</b>	<b>Never</b>
<b>Viewing scenery and wildlife</b>	21.8%	40.0%	16.4%	21.8%
<b>Fitness</b>	26.3%	33.3%	15.8%	24.6%
<b>Going to a festival or event</b>	11.9%	44.1%	25.4%	18.6%
<b>Social - meeting or visiting people</b>	12.3%	40.4%	22.8%	24.6%
<b>Other, please list (playground, tennis)</b>	26.7%	13.3%	6.7%	40.0%
<b>Picnicking</b>	3.6%	16.4%	29.1%	50.9%
<b>To work on artistic activities such as painting, photography or music</b>	3.8%	17.3%	21.2%	57.7%
<b>Getting to work or school</b>	11.8%	7.8%	9.8%	70.6%
<b>Getting to shopping or errands</b>	7.7%	1.9%	9.6%	80.8%

Table 13.

For Boyd Park, what are the three most important factors you consider when you decide whether or not to use this park? (n = 53)

Answer	Priority	Priority	Priority 3
	1	2	
<b>Programmed activities</b>	15	8	6
<b>Natural scenery</b>	8	12	14
<b>Distance from my home</b>	9	10	5
<b>How easy it is to get there</b>	10	8	8
<b>Security / safety</b>	7	5	8
<b>Weather</b>	6	4	10
<b>Recreational amenities (like playgrounds or exercise equipment)</b>	1	5	4
<b>Social amenities (like grills, covered shelters, bathrooms)</b>	0	3	1

Table 14.

How are you most likely to get to Boyd Park? (n = 60)

	%
<b>Car</b>	53.3%
<b>Walk</b>	33.3%
<b>Bicycle</b>	8.3%
<b>Other:</b>	5.0%
<b>Public Transportation</b>	0.0%

Table 15.

For what purposes do you use Boyd Park? (n = 55)

Question	Often	Sometimes	Rarely	Never
Going to a festival or event	23.6%	43.6%	16.4%	16.4%
Viewing scenery and wildlife	23.1%	32.7%	21.2%	23.1%
Fitness	14.3%	18.4%	16.3%	51.0%
Social - meeting or visiting people	4.1%	28.6%	28.6%	38.8%
To work on artistic activities such as painting, photography or music	6.1%	16.3%	18.4%	59.2%
Other, please list	12.5%	12.5%	12.5%	62.5%
Picnicking	2.0%	18.4%	14.3%	65.3%
Boating (including canoe & kayaks)	6.1%	16.3%	10.2%	67.3%
Getting to work or school	8.3%	2.1%	6.3%	83.3%
Getting to shopping or errands	2.1%	4.2%	6.3%	87.5%
Fishing	2.1%	6.3%	6.3%	85.4%

## *Baseline Health Assessment*

The baseline health assessment summarizes current health data about the affected populations, with an effort to identify and document any health disparities/inequalities that exist among population subgroups. Due to resource limitations, a desktop HIA usually does not include indicators beyond those that measure concepts depicted in the HIA pathway model, and relies almost exclusively on existing secondary sources. In the case of this HIA, some limited health data is presented from the survey sample, with a strong caveat, repeated, that the sample is not representative of the New Brunswick population.

Many health statistics are only collected at the county level. However, New Brunswick's health profile is likely to differ greatly from Middlesex County's due to a very different socioeconomic profile, making the health data at the county level an incomplete reflection of health in urban New Brunswick.

Health statistics show that Middlesex County residents are slightly less physically active and have access to fewer recreational resources compared with the average NJ County. (See Table 16). On most other measures related to the health benefits or impacts of public access, county residents rank the same or better than state metrics. Although obesity figures are lower than the state average, the percentage of obese adults has been trending generally upward in Middlesex County since 2004.

Table 16.  
Middlesex County Health Statistics (2013)\*

<b>Health Issue</b>	<b>Middlesex</b>	<b>NJ</b>
<b>Mental Health</b>	3.0%	3.3%
<b>Inadequate Social Support</b>	22.0%	23.0%
<b>Rate of Recreational Facilities (per 100,000)</b>	11	14
<b>Access to Healthy Foods</b>	63.0%	57.0%
<b>Childhood (2 - 5) Overweight and Obesity</b>	N/A	24.7%
<b>Adult Obesity</b>	24.0%	25.0%
<b>Physical Inactivity</b>	27.0%	25.0%
<b>Overweight and Obesity Grades 9 - 12</b>	N/A	24.7%
<b>Diabetes</b>	9.2%	9.0%
<b>Heart Attack</b>	35/10,000ppl	35/10,000ppl
<b>Asthma - Adults (Current)</b>	8.4%	7.7%

Although health data for city residents is not readily available, there are some indications that New Brunswick residents suffer from high rates of mental health disorders, diabetes and childhood obesity, poor nutrition, high rates of domestic violence and elevated blood lead levels<sup>3</sup>.

The New Jersey Childhood Obesity Survey<sup>4</sup> provides an important summary of factors affecting health of New Brunswick families and children. (It is important to note that the data from this survey are now

<sup>3</sup> Pellerano and Jahn, 2014

<sup>4</sup> Rutgers Center for State Health Policy, New Jersey Childhood Obesity Survey 2010, Chartbook: New Brunswick. Kristen Lloyd, MPH, lead author

seven years old and there is an expectation that improvements have been achieved as a result of new and enhanced programs.) Data from the 2010 survey indicate that:

- New Brunswick children are more likely to be overweight or obese compared to their national counterparts. The largest differences between New Brunswick public school children and national estimates are seen among the youngest children (48% in New Brunswick versus 21% nationally for overweight and obese).
- Only 12% of the children meet the Healthy People 2010 recommendations for eating vegetables three times per day.
- Although most parents shop at supermarkets and superstores, nearly one-quarter of Hispanic parents shop at corner stores or bodegas for most of their food shopping.
- Most children (81%) do not meet the guidelines for being physically active for 60 minutes each day. A large proportion of non-Hispanic Black children spend more than two hours per day watching television, using the computer and playing video games. The majority of children do not walk or bike to school and some do not use the sidewalks, parks and exercise facilities available in their neighborhoods.
- Although many neighborhoods have sidewalks and some have parks and exercise facilities, a fair number of parents report that their children do not use these facilities to be active. Traffic, crime level, pleasantness of neighborhoods and parks, and condition of sidewalks are the most commonly reported barriers.
- More than a quarter of households reported that someone in their household suffered from a mental health disorder (Weiner, et al, 2011).
- A third of high-utilizing admitted hospital patients had mental health comorbidities (Chakravarty, et al., 2013).
- Among screened children less than six years of age, nearly twice as many New Brunswick children had confirmed elevated blood lead of  $\geq 5$   $\mu\text{g}/\text{dL}$  as children in Middlesex County (1.7 %) (NJDOH Lead, 2014).

From the survey conducted to inform this HIA, we found that about 52% of our survey sample reported that their physician has advised increased physical activity. We also asked the following question that is identical to one asked by the national BRFSS survey. Some of the disproportionately high figures are that more than 40% of the sample reported having depressive disorder, and that more than 25% suffered from asthma

Table 17.

Have you EVER been told by a doctor or other health professional that you had...? (please check all that apply) (n = 33)

Condition	Percent
A heart condition	9.1%
Diabetes	3.0%
Asthma or other respiratory illness	27.3%
High blood pressure	48.5%
Obesity	24.2%
Depressive disorder	42.4%

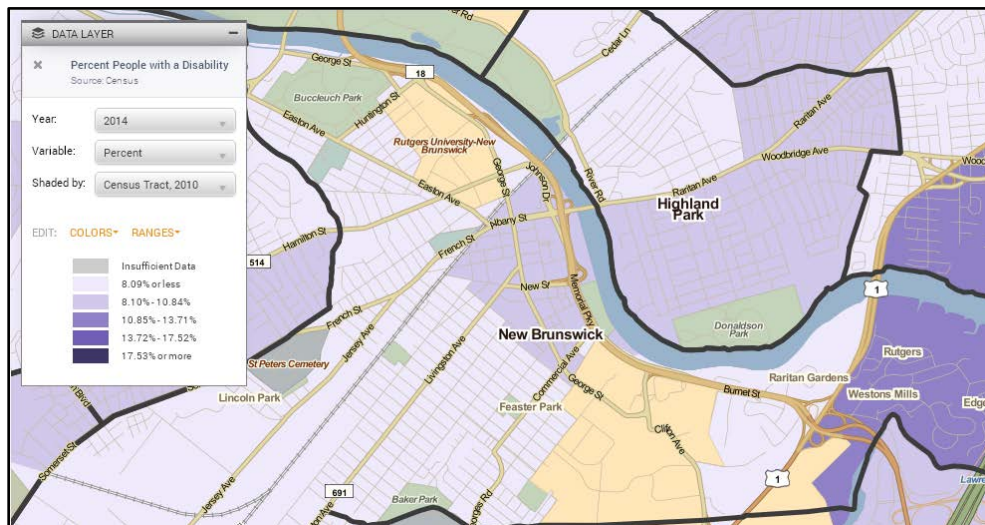
It is important to acknowledge data gaps in order to increase transparency and aid interpretation of our findings. Notable gaps in available data for this project include:

- Data on most types of morbidity by neighborhood
- Data on physical activity by neighborhood
- Data on some racial/ethnic disparities (due to small numbers)

*Geography of Health Statistics*

Map 3 shows that a higher proportion of people with disabilities living in the areas closest to Boyd park and near the downtown of New Brunswick. This is likely due to the location of senior living facilities within a couple of blocks from the River in this part of the City.

**Map 3**  
**Percent of People with a Disability by Census Tract**

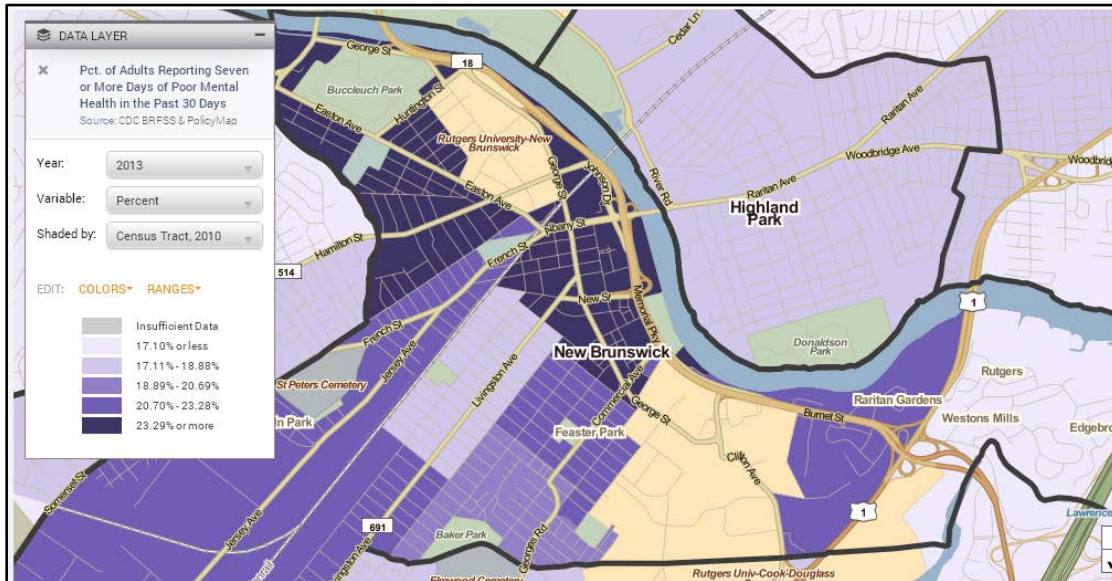


Source: PolicyMap

The next two maps show that there are higher concentrations of people reporting both more poor mental and poor physical health days in the census tract right along the River, particularly the tract that runs from Albany St. to Commercial Ave. in the .5 mile from the bank of the River.

Map 4

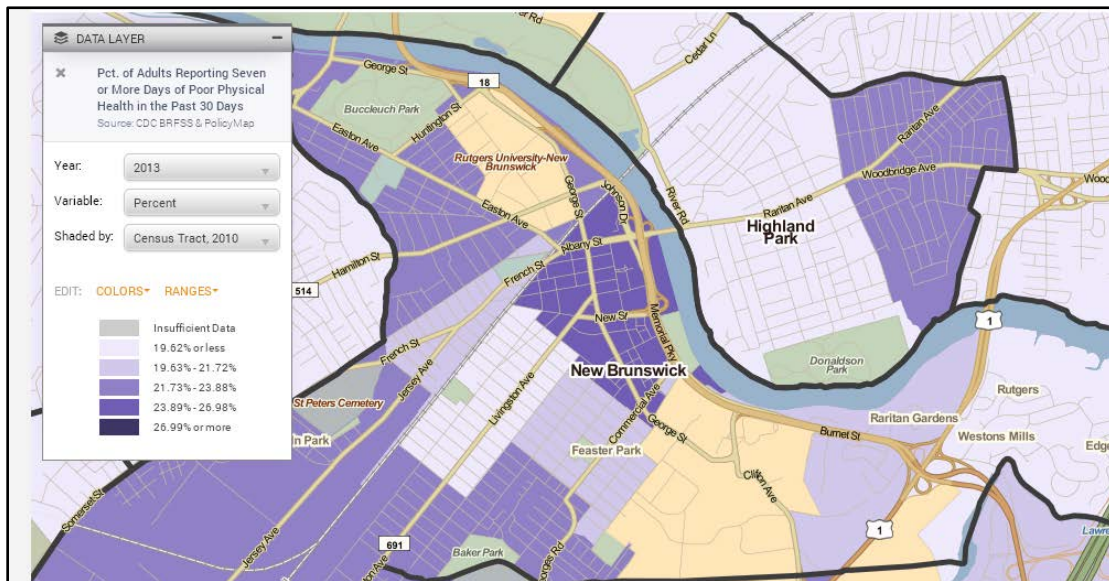
Percent of People Reporting Seven or More Days of Poor Mental Health in the Past 30 Days by Census Tract



Source: PolicyMap

Map 5

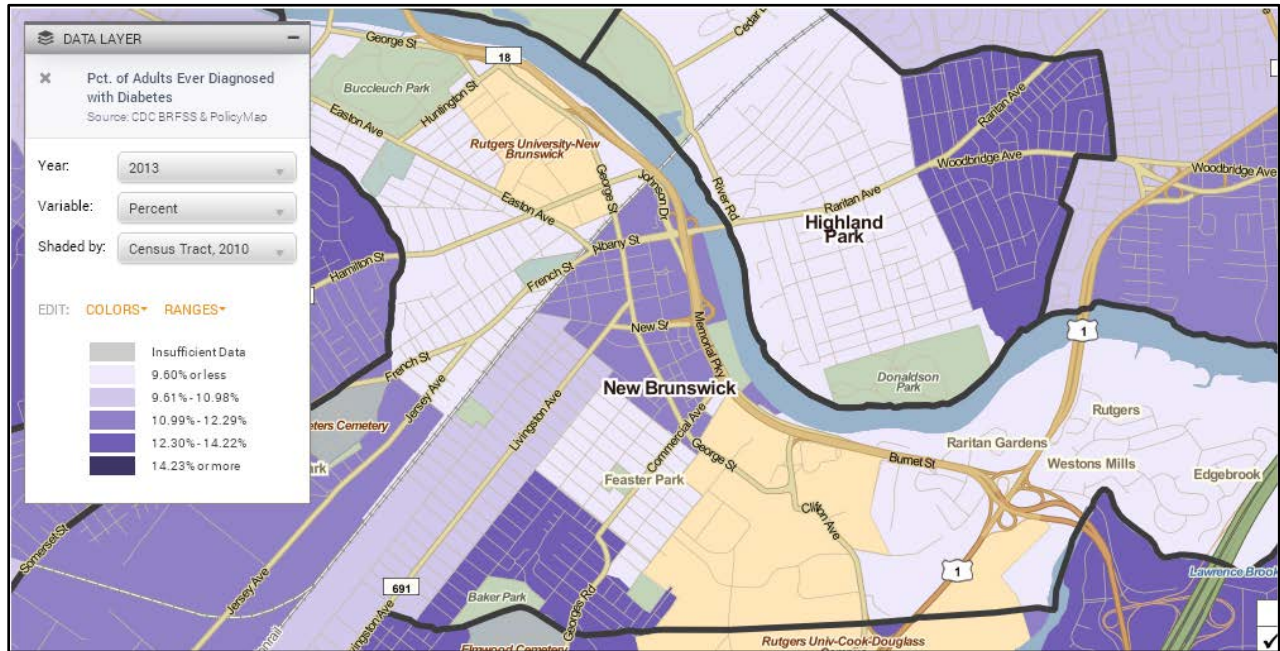
Percent of People Reporting Seven or More Days of Poor Physical Health in the Past 30 Days by Census Tract



Source: PolicyMap

Finally, the same tract shows fairly high proportions of people reporting diagnoses of diabetes, second highest to another tract located further west and away from the River.

Map 6  
Percent of People Ever Diagnosed with Diabetes by Census Tract



Source: PolicyMap

## V. PROJECTION ASSESSMENT

The projection assessment in a desktop HIA presents a mostly qualitative characterization of expected health effects based largely on a literature review and any other analyses that can be performed in a limited time that lends support or clarity to the assessment. For this HIA, some survey results, as well as open-ended comments obtained through the survey and from feedback at the two presentations of the preliminary findings, are woven into the assessment and used to help to elucidate or validate conclusions.

For each health determinant, there are three main subsections: connections to health, community context, impacts and findings, and recommendations. The “connections to health” section is a summary of the literature about ways that the determinant influences health. Implications for vulnerable subpopulations are also broken out. The “community context” section summarizes community input and any location-specific data that is relevant to evaluating the health impacts. The “findings and recommendations” section describes the predicted impacts of the MPAP on population health, with a focus on subpopulations and uses these findings to inform suggested strategies for decision-makers to maximize the positive health impacts and minimize the negative health impacts while implementing the maintenance and enhancement of public access to the Raritan.

Before presenting the findings for each of the four primary health determinants – safety, outdoor activity, social interaction and local economic development – some data from the survey pertains to a larger and

over-arching question that is important to consider and helps to inform all of the questions. That is, what are some of the features, events or amenities that would draw more people to use the current public access areas at Boyd Park and near Diener and Buccleuch Parks, and to the other open space (conservation) areas along the River?

In general, respondents indicated that the top reasons that they would use the three parks more were if: there were more special events (71.8%); they had improved safety against crime (71.6%); they were cleaner and better maintained (64.7%); or they offered canoe, kayak or paddleboarding rentals (63.4%).

Respondents said that if they had improved access to the waterfront, over 50% of them would engage in more walking, kayaking/canoeing, nature study and guided river tours. This suggests that if these amenities were available, there would exist a demand to use them.

Table 18.

Would you use Buccleuch, Boyd or Deiner parks (or if you currently use them, would you use them more) if:

	<b>Yes</b>	<b>No</b>	<b>Maybe</b>
<b>There were more special events, like music or art festivals</b>	71.8%	8.5%	19.7%
<b>There was improved safety against crime (lighting, patrols, etc.)</b>	71.6%	10.4%	17.9%
<b>They were cleaner and better maintained</b>	64.7%	16.2%	19.1%
<b>They had canoe, kayak or paddleboarding rentals</b>	63.4%	21.1%	15.5%
<b>There were safer and easier ways to get there by foot or bicycle</b>	55.7%	17.1%	27.1%
<b>There were food concession stands or restaurants</b>	54.4%	20.6%	25.0%
<b>There were more benches and picnic tables</b>	46.9%	28.1%	25.0%
<b>There was better / more parking nearby</b>	40.6%	26.1%	33.3%
<b>There were better water safety protections</b>	38.2%	44.1%	17.6%
<b>There were grills and covered picnic shelters</b>	33.8%	32.3%	33.8%
<b>There was better disability (ADA) access</b>	21.2%	62.1%	16.7%



Table 19.

What types of things would you like to do in the New Brunswick open space areas if they had better public access? And how often would you do them?

	<b>Often</b>	<b>Sometimes</b>	<b>Rarely</b>	<b>Never</b>
<b>Other (walking)</b>	35.3%	17.6%	0.0%	35.3%
<b>Kayaking or canoeing</b>	26.5%	30.9%	17.6%	25.0%
<b>Nature study</b>	20.6%	32.4%	20.6%	26.5%
<b>Guided river tours</b>	19.7%	39.4%	12.1%	28.8%
<b>Dog run</b>	17.2%	21.9%	7.8%	53.1%
<b>Exercise stations</b>	14.3%	31.7%	19.0%	34.9%
<b>Birding</b>	13.0%	31.9%	18.8%	36.2%
<b>Swimming or wading</b>	10.9%	12.5%	14.1%	62.5%
<b>Paddleboarding</b>	10.8%	15.4%	21.5%	52.3%
<b>Water safety instructions</b>	9.7%	14.5%	21.0%	54.8%
<b>Open air art classes</b>	9.4%	32.8%	15.6%	42.2%
<b>Fishing</b>	6.3%	19.0%	15.9%	58.7%
<b>Boating/sailing</b>	6.1%	31.8%	16.7%	45.5%
<b>Fishing instruction</b>	3.2%	11.3%	17.7%	67.7%

Other stakeholder input, from comments written on the surveys and also including some feedback from attendees at the conference presentation and presentation before the Environmental Commission are also important context and contributing data relevant to all of the health factors below. Regarding barriers to public access, the most commonly mentioned was that improved and safer pedestrian and bicycle access. Creating more awareness of access points was also important to community members. For example, from the middle of the Rutgers College Avenue campus, it is hard to find a way to walk to the river, and access to Boyd Park is perceived as cumbersome and unsafe. Likewise, input about Deiner Park and Buccleuch Parks focused on improving access and safety of access points and paths.

*“People don't know that they can get to these areas and use them for their pleasure.”*

*“The real key for me is making the path from Deiner to Boyd safe. The path isn't maintained and isn't wide enough to accommodate steady traffic.”*

*“The bicycle path to the north of Boyd Park ...is very dangerous and intimidating. There is extensive graffiti, criminal activity openly taking place, homeless people camped out and living in the area, and garbage everywhere. The police need to permanently move this element out of the area or people will be afraid to use it.”*

Other barriers and concerns mentioned in survey comments included the homeless people under the bridges along the river and concerns about safety that are brought about by the transient population, concerns about drug use, lack of upkeep of the asphalt walkways, broken lights and locked bathrooms (at Boyd Park). Several were concerned about noise and wakes from jet skis that disrupt the peacefulness and wildlife.

Some of the key benefits of accessing the river front mentioned by survey respondents include access to nature and walking and jogging along the paths. Some ideas to improve the waterfront area include a restaurant, tourist boat rides, birdwatching walks, charity events like organized walks, and stronger police presence to discourage drug dealing.

*“There should be more information about access. Continue to schedule events that invite the public to help to maintain the area.”*

*“I do like to birdwatch along the Raritan, but have not found it too possible in New Brunswick.”*

## ***HEALTH DETERMINANT – SAFETY***

The HIA breaks safety into two aspects. One is the safety related to unintentional accidents that could occur with public access to waterways, and the other is safety related to injuries or assaults that could occur due to intentional or criminal activity.

### ***Accidents and Hazards***

#### ***Connections to Health:***

When people are in the proximity of waterways, there exists a risk that either intentional (wading, swimming) or unintentional (falls, accidents) entry into water can occur from shore or from boat. The health outcomes associated with this could range from injuries from falling, to near-drownings to death from drowning. The CDC (2012d) reports that ten people die every day from unintentional drowning, which is the fifth leading cause of unintentional death in the U.S. While drowning can occur at a multitude of locations, more than half of drowning, non-fatal and fatal, for those ages 15 and over occurs in natural water settings (lakes, rivers, and oceans) (CDC, 2012d).

Rivers pose a greater drowning risk than swimming pools, according to recent studies of Australian drowning deaths (Franklin et al, 2010, Peden and Queiroga, 2014). Another study found that in the age 5–64 years, over 69% of drowning deaths were in open water (Quan and Cummings, 2003).

There are interventions that can reduce drowning risks. For example, fencing has been shown to reduce drowning in swimming pools and has shown to be effective. A review of safety messages found the most evidence to support the importance of supervision and alcohol avoidance (Moran et al, 2011). However, there is a lack of tested interventions to prevent drowning in natural bodies of water.

If people using the waterfront areas or in boats are drinking alcohol to excess, drownings are more likely. An Australian study (Gulliver, 2005) found that alcohol was known to be involved in at least 37% of all river drowning deaths. In the middle-aged (45-54) group, deaths known to involve alcohol accounted for almost half (49%) of all drowning deaths.

Males are more prone to water-related injuries and accidents than females (Krau, 2013). The male burden in river drowning deaths in a 10-year study of Australian drowning deaths was most prominent in the 25-34 years age group where males accounted for 92% of all drowning deaths experienced in people in that age group (Peden and Queiroga, 2014). This study also found that falls into water were the most common

activity being undertaken immediately prior to drowning in rivers (20%), and that 17% of all river drowning deaths were known to be related to flooding, as a result of either being swept in or deliberately entering floodwaters in non-aquatic transport.



Young children along canal path in Boyd Park

Regarding boating in particular, each year over 600 people die and more than 4000 are reported injured in recreational boating accidents. A study of Coast Guard accident reports showed that boating errors are specific to the type of craft, so that boating education needs to be specific geared to individual boat types (McKnight et al, 2007).

Aside from drowning or near-drowning related injuries and mortality, other safety concerns are related to the active use of a linear trail and the safety of the access routes to the waterfront locations. On a trail, there are numerous ways that accidental injuries could occur. On a multi-use trail, people are moving in different ways and at different speeds, and some may be stopped. Bicycles could collide with walkers, or skateboarders could collide with people pushing strollers. A trail or park user could also suffer an injury from a fall not caused by a collision.

Busy roads, unsafe crossing or poor signage can also create physical access barriers to traveling to the waterfront areas (Blanck et al, 2012). Providing a safe route and entrance to the parks and trails with ample signage is critical to safe utilization. Though the risk of a collision can never be eliminated, literature shows that the likelihood that a given person walking or bicycling will be struck by a motorist varies inversely with the amount of walking or bicycling normally present in the community. If increased public access to waterfront areas is well-managed, pedestrians, bicyclists and drivers become accustomed to the volume and flow, evidence shows that the proportion of injuries and crashes can actually decrease with more users (Pucher and Buehler, 2012).



Access to the River near Buccleuch Park requires crossing a busy road

### ***Vulnerable populations***

Studies show that racial and ethnic minorities are most at risk for drowning. Research conducted by the CDC found that African Americans have a higher rate of drowning than whites (CDC, 2012d). This is especially true for children ages 5 to 14: African American children are three times more likely to drown than white children (CDC, 2012d). Poor minority children, specifically African-American and Hispanic/Latino, are at a significant disadvantage concerning swimming ability. Female subjects were notably more “at risk” regarding their swimming ability than male subjects. Age, race and socioeconomic factors were significantly associated with children who have low swimming ability (Irwin et al, 2009).

Very young children are also disproportionately likely to suffer water-related accidents, and drowning is a leading cause of death for children 0 to 4 (Krau, 2013). Children's energy, inquisitiveness and lack of coordination make them more susceptible to falling into bodies of water. A study of child drowning in Bangladesh (Hossain et al, 2016) found risk factors for drowning that included the following: children not being able to swim, ditches that were not filled in, lack of medical facilities, parents who were not aware of childhood drowning and lack of information through the media about how to prevent of childhood drowning. A study of life jacket use to prevent childhood drowning concluded that highest life jacket use was strongly associated with laws requiring use and with adult role modeling (Chung et al, 2014).

Regarding concerns about safety of access routes and use of waterfront facilities and trails, safety concerns are the most disproportionate for the elderly and disabled and for children. Senior pedestrians have slower walking speeds and increased reaction time. This coupled with increased frailty puts older adults at greater risk of pedestrian injury (Harrell, 1991). For children ages 5 to 9 years, recreational injuries are most likely to occur on the playground and while riding bicycles. Likewise, for older children, cycling injuries are among the most common (National SAFE Kids Coalition, 2012).



Signs warning about swimming in the Raritan at Boyd Park

### ***Community Context***

Input received through the survey and through informal feedback when the HIA was presented at meetings has highlighted safety and accident concerns related to public access to the Raritan in New Brunswick. Some of the comments have to do with safety of using the current paths, and with dangers of accessing the waterfront areas from residential or campus areas of the city, including a desire for improved access and connection between Boyd Park and the city, with safe ways to cross Rt. 18.

*“The paths in Boyd park are slightly slanted - any consistent runner can feel the impact on their hips or back from running that path along the river often.”*

*“The real key for me is making the path from Deiner to Boyd safe. The path isn't maintained and isn't wide enough to accommodate steady traffic.”*

*“(It is important to create a)...safe exit from bike path on Rt 18 over the river that dead ends dangerously at Bucchleuch Park--it should continue above that road and deposit riders safely on the other side of the road.”*

*“(There is a) lack of upkeep of the asphalt walkways...”*

While concerns about drowning and water or boating-related accidents did not figure in documented community input, it is a concern that the larger research team working on Raritan issues has heard in other contexts, particularly from the Latino population.

### ***Findings and Recommendations***

The literature and survey results support the recommendations in the MPAP concerning the need for continued maintenance and repair of waterfront amenities, and for significant enhancement of the current “trenchway” to be a much safer thoroughfare with a smooth, wider surface, signage and protective

fencing. Continued efforts to improve the safety of access routes and road crossings to the waterfront is important at Boyd Park and from the Rutgers College Ave. Campus and Buccleuch Park areas. Improved signage at the “dead end” portion of the D and R Canal, along the trenchway, and in the conservation area, if developed, will avoid dangers related to users who need to quickly exit the path for safety reasons and to understand water safety concerns.

Findings also strongly support that information and preparedness are important in determining the severity of accident risks. Vulnerable subpopulations of Hispanic, African-American, lower-income, elderly and children are more at risk for most accidents and injuries, with young adult males also disproportionately at risk for drownings.

#### Recommendations:

Planning for a safe waterfront will consider all reasonable steps to minimize crashes, collisions and accidental injury risks, whether users are en route to the public access areas or using the waterfront area.

Recommendations to reduce risks of accident and injury associated with the goals of the MPAP include:

- Improved fencing and water safety signage in English and Spanish will increase safety for all and, in particular, younger children.
- A water safety education program, offered in both English and Spanish and targeted toward lower-income and immigrant populations, could be effective in increasing knowledge and awareness to prevent drowning. The program should highlight the dangers of flooded rivers.
- For boaters, messaging should encourage adult life jacket wear in the company of children and youth.
- Water and boat safety should be presented in programs and found on signs, particularly regarding anti-alcohol for boat operators.
- Local rescue personnel should be trained for waterfront and on-the-water rescues.
- Programming and events that are specific to seniors and children like chaperoned walks, will help to address safety concerns of these groups.
- An assessment of the safety of road intersections along common access routes, and of waterfront path conditions would help to prioritize locations for improvements. Where possible, retrofit existing streets for safer pedestrian and bicycle crossing and improve off-street paths related to public access.
- Reducing potential collisions and injuries will require education and awareness of proper pathway use (following etiquette, staying to the right, yielding to pedestrians, etc.). For cyclists, defensive riding (giving the person warning you are passing, slowing speeds, obeying rules of the road, etc.) is important.

## *Crime*

### *Connections to Health:*

Real or perceived crime causes many health effects, from physical injury to mental trauma. Many studies have shown that concerns about lack of personal safety can prevent people from engaging in activities

that take them outside (Jackson & Kochtitzky, 2009, American Association of Pediatrics, 2009), thereby reducing the positive effects of parks and trails promoting physical activity.

These concerns can stem from actual personal safety threats, or from a fear of crime that can exist even in the absence of actual reported crimes. A fear of crime is often more influenced by individual factors than social and physical factors, making it challenging to combat. However, literature indicated that the more people using an outdoor amenity increases a sense of security (Crewe, 2001), and can also deter real crime (Tracy and Morris, 1992). When there is a perception that people are watching, crime is often less likely to occur and people tend to feel safer (Loukaitou-Sideris & Eck, 2008).

Research supports effective strategies for reducing both actual and perceived crime. Good lighting and readable signs about location, wayfinding and crime reporting information are effective tactics for reducing crime (Ross et al, 2012). Also, natural surveillance through strategic placement of plantings and open line-of-sight designs is a way of keeping the environment well-maintained so that people can be easily be seen and there are few places for unwanted activities (McCormick, 2006). These changes in environmental design, promoted by programs like “Crime Prevention through Environmental Design” (CPTED) are often more effective than simply providing additional police power.



Stairs to the trenchway behind Deiner Park create perception of crime

### ***Vulnerable populations***

Certain subpopulations are more sensitive to the issue of personal safety in the built and natural environment than others. Reduced levels of physical activity caused by fear of crime is especially likely in women over 65 years, non-white female populations and low-income individuals (CDC, 1999; Deutsch and Goulias, 2010; Ross et al, 2007).

### ***Community Context***

Some of the specific concerns with regard to personal safety along the Raritan waterfront that have surfaced include the presence of homelessness in the area just north of Boyd Park along the trenchway, presence of trash and graffiti that might indicate gangs or drug use, relatively poor lighting in the evening and feeling of isolation with so few people using the area and the detachment from the rest of the city

population. People fear that if there is an assault of some type, law enforcement would not appear in time to help.

This comment on the survey summarizes some of these concerns:

*“There is extensive grafitti, criminal activity openly taking place, homeless people camped out and living in the area, and garbage everywhere. The police need to permanently move this element out of the area or people will be afraid to use it.”*

Survey results indicated that a majority of people did not feel that Boyd Park was safe between 5PM and 8AM, and the strongest reasons were the isolation of the park and the fear of crime, with poor lighting also mentioned.

Table 20

Do you think Boyd Park is safe during the following times of the day? (n = 49)

Question	Yes	No
<b>6 to 8 am</b>	62.5%	37.5%
<b>8 am to noon</b>	95.6%	4.4%
<b>noon to 5 pm</b>	98.0%	2.0%
<b>5 to 9 pm</b>	38.7%	61.3%

Table 21

If you answered "no" to any of the time frames in the previous question, why do you feel the park is unsafe during those times? Select all that apply. (n = 20)

Answer	%
<b>The park seems isolated.</b>	70.0%
<b>I'm afraid of crime.</b>	70.0%
<b>Poor lighting</b>	50.0%
<b>There is no one around.</b>	40.0%
<b>Other:</b>	10.0%
<b>I'm afraid of being near the water.</b>	0.0%

Fewer people felt that Buccleuch Park was unsafe, but the time that more people reported feeling unsafe was in the evening hours, and again, park isolation was the top reason, followed by lighting and fear of crime. Similar answers were provided for Deiner Park, with evening hours deemed the least safe by more people, and poor lighting and isolation as the reasons.



Table 22.

Do you think Buccleuch Park is safe during the following times of the day? (n = 61)

	<b>Yes</b>	<b>No</b>
<b>6 to 8 am</b>	90.2%	9.8%
<b>8 am to noon</b>	100.0%	0.0%
<b>noon to 5 pm</b>	100.0%	0.0%
<b>5 to 9 pm</b>	66.7%	33.3%

Table 23.

If you answered "no" to any of the time frames in the previous question, why do you feel the park is unsafe during those times? Select all that apply. (n = 14)

<b>Answer</b>	<b>%</b>
<b>The park seems isolated.</b>	57.1%
<b>Poor lighting</b>	50.0%
<b>I'm afraid of crime.</b>	50.0%
<b>There is no one around.</b>	21.4%
<b>Other:</b>	21.4%
<b>I'm afraid of being near the water.</b>	0.0%

***Findings and Recommendations:***

It is clear that in New Brunswick, perceived crime affects use of public areas and residents have concerns about personal safety. It is important to note that the study did not ascertain the number or extent of actual crimes along the trenchway, at Boyd Park or in the conservation areas.

While it is difficult to project whether the actual number of crimes that occur along the waterfront might increase or decrease with more people accessing the area, evidence suggests that the more people that are on a trail or in a park, the less isolated people feel and the resultant fears of crime are reduced. If public access is designed to foster additional “eyes” on the areal through strategic vegetation maintenance and possible use of security cameras, crime can be deterred.

Some recommendations to improve feelings of security and minimize the fear of crime so that the health benefits of public access to the Raritan can be realized for more users include:

- Maintain consistent lighting of pathways and gathering areas in evening hours.
- Install signs that are visible and readable, with information related to crime prevention techniques and reporting.
- Install “where are you?” signs along pathway to indicate proximity to endpoints or landmarks and to improve the quality of response to any emergency calls, and users’ knowledge of their location.
- Consider installation of call boxes in Boyd Park and along pathway (and conservation area, if a pathway is eventually constructed).

- Implement continued local police patrol, particularly at certain times of day when more vulnerable population may be using the area.
- Consider locations for surveillance cameras and/or “mock” cameras that are marked by signs.
- Implement CPED, where possible, such as in places with heavy vegetation, where strategic cutting can help to reduce feelings of isolation.
- As the waterfront pathway improvements are implemented, encourage a local “Raritan waterfront watch” program, modeled after successful “neighborhood watch” programs.
- Work with local social service agencies to address the homeless population. Encourage the elimination of litter, graffiti, and deteriorated property conditions (weeds, broken windows, etc.)

## **HEALTH DETERMINANT: OUTDOOR ACTIVITY**

If the goals and strategies of the MPAP are adopted and implemented, the result should be more people going to the Raritan waterfront areas to engage in various outdoor passive or active activities, from picnicking, enjoying scenery, or fishing from the banks, to walking, biking, kayaking, or social events.

Outdoor activity is split into two different types of exposures for the purposes of assessing the health impacts. First is the exposure to the greenspace that allows the opportunity to engage in physical activity and enjoy other health benefits. The second is the exposure to vectors such as animals, allergens or fish consumption, which can bring both positive and negative health outcomes.

### *Exposure to Greenspace*

#### *Connections to Health*

A great deal of research supports the positive association between the presence of open space and parkland in a community and many positive health outcomes in nearby residents (O'Donovan et al., 2010; Vuori, 2010). There are direct physical and mental health impacts, as well as more indirect impacts that can result in improved quality of life and mental health. While physical activity is the benefit most commonly associated with parks, trails and watersports, there are mental health implications of outdoor and park space as well. The American Planning Association (APA) has identified key ways that urban parks promote health (American Planning Association, 2003). One is that by connecting people with nature, certain health benefits like lower cholesterol and lower levels of stress and depression are conferred, and second is the opportunity for physical activity and fitness, which helps to combat obesity, reduce the potential for co-morbidities, and decrease non-routine medical checkups.

To the extent that the Raritan riverfront access plan is implemented, creating a pathway that connects neighborhoods, Rutgers campuses, and communities on opposite sides of the River in a continuous path, it will allow for and encourage biking and walking to, from, and between them. The public access areas thus present an opportunity to increase physical activity within the region by making it a way of life.

Access to public spaces for recreation is an important factor in the ability to exercise (Cohen et al, 2007; CDC, 2001) and this would be particularly important in densely populated neighborhoods with compact properties and little open space. One study found that people who live near trails are 50% more likely to

meet physical activity guidelines (Pierce et al, 2006). Individuals are more likely to utilize parks if they are close to where they live, are safe, and are regularly maintained (Jackson and Kochtitzky, 2009). A review of studies showed that access to places for physical activity combined with outreach and education can produce a 48 percent increase in the frequency of physical activity (Kahn, 2002).

Approximately 60 percent of the U.S. adult population is at risk for diseases associated with physical inactivity because they do not achieve the recommended 30 minutes of daily physical activity (National Institute on Aging, 2000), and 25 percent of all adults are completely inactive (National Center for Chronic Disease Prevention and Health Promotion, 1999). Regular physical activity could increase for local residents if the river trenchway is enhanced, providing a safe and appropriate space for jogging, walking and bicycling. Even modest increases in physical activity have the potential to produce significant health benefits (Pate, Pratt et al., 1995). Specifically regarding physical health benefits, this could help to reduce the risk of developing heart disease, stroke, diabetes, obesity, some forms of cancer, high blood pressure and high cholesterol (O'Donovan et al., 2010; Sothorn, Loftin, Suskind, Udall, & Blecker, 1999).



*Jogging along the trench way provides physical health benefits.*

Regarding mental health benefits, research shows that open-air recreation provides relaxation, refreshment, and way to engage in social interactions (Dannenberg *et al*, 2011; Trust for Public Land, 2007). Exposure to nature and open space has a positive effect on mood and improves symptoms of stress. Physical activity is associated with decreased feelings of loneliness and increased lifespan for individuals (Groenewegen et al, 2012). There is a strong connection between exposure to the outdoors and improved mental health, particularly when it is shared as a social activity. The relative quiet and beauty of nature provides a refuge from everyday stressors, and social interaction combats loneliness (Maller et al, 2006).<sup>i</sup> Studies have shown decreased symptoms of depression and anxiety, and an overall improvement in well-being from physical activity and from access to green spaces (Van Den Beg et al, 2010; Groenewegen et al, 2012).

Studies have found that the visual presence of natural vegetation and trees improves adult recovery from mental fatigue, leading to a reduction in socially unacceptable behavior and crime, and can improve problem solving and cognitive function in people living in public housing (Kuo and Sullivan, 2001; Taylor et al., 2001).

### ***Vulnerable populations***

Populations disproportionately affected by access to outdoor spaces for physical activity include lower income, minorities, children and older adults. For those who are of lower income, the presence of the new open space helps to address common disparities in access to parks and trails for those in poor neighborhoods (Gordon-Larson et al, 2006). The open space, if it contains paths for passive recreation, can help poorer residents, who cannot afford paid membership at a health club, with the opportunity to meet daily recommended levels of physical activity and recreation (Cohen et al, 2007; Moore et al, 2008). Health promoting attributes of the built environment can be associated with the socioeconomic composition of the neighborhood. For example, one study found that “moving from a community with a 1 percent poverty rate to a 10 percent poverty rate is associated with a decreased prevalence of bike paths from 57 percent to 9 percent respectively” (Powell et al., 2004). Parks and open space can provide a no- or low-cost option for physical activity in low income communities by providing a walking destination and facilities for recreation, organized sports, and exercise activities. Individuals are more likely to use a park if it is close to where they live. Low income and minority individuals also typically lack access to healthy foods which contributes to the overweight and obesity problems (ICMA, 2005).

According to the CDC, non-Hispanic blacks have the highest rate of obesity (47.8%), followed by Hispanics (42.5%), non-Hispanic whites (32.6%), and non-Hispanic Asians (10.8%) (CDC, 2015). Similarly, recent data show a strong relationship between socioeconomic status and obesity. About 35% of adults earning less than \$15,000 were obese in 2009, compared to only 24.5% of those making \$50,000 or more (Cranz and Boland, 2004).



*Children benefit from exposure to nature.*

Children are a specific subpopulation that can benefit disproportionately from easy access to a safe place to walk, run, and bike and there is moderate scientific evidence that physical activity is connected to reduced anxiety and depression in children (Epstein et al, 2012). Exposure to greenspace has been shown specifically to assist the development of feelings of well-being in children, helping them to learn emotional and behavioral connections to nearby natural and social environments (Kahn and Kellert). Natural environments have been found to increase concentration and reduce behavior problems among children generally, and improve functioning in children with Attention Deficit and Hyperactivity Disorder (ADHD) (Taylor et al, 2001).

For older adults, strong evidence indicates that being physically active is associated with higher levels of functional health, a lower risk of falling, and better cognitive function (Physical Activity Guidelines Advisory Committee, 2008). There is a strong connection between increased levels of activity and improved cardiorespiratory and muscular fitness, prevention of falls, reduced depression, and better cognitive function in the elderly.

***Community Context***

We know from observation and from community input from the survey (see above) that there is a demand for waterfront space and a safe pathway along the River for strolling, jogging and bicycling. There is also a demand for more access to kayaking in the Raritan. We also know from observation and survey comments that the current space and paths are under-utilized relative to the population of residents, employees and students who live or work within walking distance. Half of the survey respondents said that if the waterfront activities and areas were more accessible, they would likely get more physical activity. This is evidence of the positive impact that improved access can have on physical fitness.

Table 24.

Do you think you would get more physical activity if you had better access to the New Brunswick waterfront parks and related activities? (n = 74)

<b>Answer</b>	<b>%</b>
<b>Yes</b>	50.0%
<b>Maybe</b>	36.5%
<b>No</b>	13.5%
<b>Total</b>	100.0%

Almost half of the respondents also said that better access to the water and waterfront would improve their mental health. Again, this is a testament to the added benefit of the public access, above and beyond existing open and greenspaces in the City.

Table 25.

Do you think your mental health would improve if you had better access to the New Brunswick waterfront parks and related activities? (n = 74)

<b>Answer</b>	<b>%</b>
<b>Yes</b>	48.6%
<b>Maybe</b>	36.5%
<b>No</b>	14.9%
<b>Total</b>	100.0%

### ***Findings and Recommendations***

Literature clearly demonstrates that increased greenspace is associated with physical and mental health benefits. Open space with opportunity for recreation that could occur with implementation of the MPAP priorities could provide very positive health impacts for physical fitness and reduction of disease. Improving public access will result in a more active population, which can lead to decreased levels of chronic diseases such as heart disease and obesity.

In terms of medical costs, studies have estimated the medical cost savings of physical activity at anywhere from \$615 to \$823 per year (Wang et al, 2005). Even if a very conservative 500 additional people obtain significantly more physical activity through using the space on or along the water with improved public access, and using the lower per year estimate, medical cost savings of over \$300,000 could occur.

Minorities, lower-income populations and the elderly are less likely to get physical activity. It is also benefits children in urban areas who have limited opportunities for outdoor physical activity.

There are also strong positive mental health impacts associated with proximity of well-maintained open space and natural scenery.

To maximize the benefits of outdoor activity for all populations, decision-makers implementing the goals of the MPAP should consider the following recommendations:

- Develop and maintain Raritan waterfront open space for maximum functioning to support active physical recreation such as walking, jogging, bicycling and kayak access.
- Consider setting aside some space on or surrounding waterfront areas for development of passive recreation (benches, picnic areas, bird blinds).
- New Brunswick can work towards improving connections and wayfinding to Riverfront locations from downtown and residential areas in order to direct the maximum pedestrian users to the area.
- Assure safe access routes from underserved neighborhoods.
- Consider developing an exercise loop within the public access area.

- Collaborate with the local bicycling organizations to bring cycling education to New Brunswick, especially children, to encourage use of the River pathway.
- Design paths and spaces for active use by multiple modes and consider more recreational programming.
- Provide opportunities for physical activities for all age groups (children, adolescents, adults, and older adults).
- Provide a parking facility for bicycles, a bicycle share or lending program (with helmets), and bicycle safety education classes; provide education for cyclists, pedestrians, and motorists on the rules of the road.
- Consider one or more basketball courts and open grassy areas and play fields where exercise programs could be held.

### *Exposure to allergens, animals and fish*

#### *Connections to Health*

Outdoor activities can cause or exacerbate conditions or illnesses from exposures to vectors in the environment, flora or fauna. Vegetated areas will expose users to potential hazards that can result in acute incidents (e.g. animal or insect bites), diseases (Lyme diseases) or allergic reactions (e.g. poison ivy). For example, if the greenspace contains vegetation with allergens, it can aggravate asthma and allergic reactions. People who already suffer from asthma or allergic reactions to pollens, trees and bushes, may suffer aggravated symptoms from these exposures. It also means possible contact with plant or insect pests like poison ivy, ticks or mosquitoes. Bites or rashes can range from being nuisances to more serious conditions requiring hospitalization. Negative encounters with wildlife or stray pets that may live or wander near the public access areas can also be a concern. If there are areas of garbage, as is visible along the bike trenchway, rodents or other wild animals may be attracted. It is also clear in walking the path that feral cats are present. In this case, users risk encounters with an aggravated or rabid animal that could result in an acute incident.



Garbage along the trenchway could attract rodents, feral pets and pests.

Another potential health impact that could be affected by increased public access, particularly if locations for fishing from the banks of the River are developed, is the consumption of fish. It is unclear how many people that fish in the River consume the fish they catch, and what percentage of any person's diet may

consist of this fish. However, it is possible that consumption of fish, although it has health benefits from omega-3 fatty acids that provide cardio-protective effects, could also pose a threat to human health from the toxicity of heavy metals (Castro-Gonzalez and Mendez-Armenta, 2008) or PCBs. Recreational and subsistence fishing play an important and underestimated role in urban areas, and there are fish and shellfish consumption advisories in the New York–New Jersey harbor estuary, particularly in the waters of the Newark Bay Complex (Burger, 2002). The 2016 Waterbody Specific Advisory for the Raritan Bay Complex lists fish like Striped Bass and Channel Catfish as safe to eat only once a month for normal populations and suggest that high risk populations do not eat the fish at all (NJDEP, Waterbody..., 2016).

### ***Vulnerable Populations***

Regarding sensitivity to allergens, literature shows that children living in low-income families since birth have twice the rate of likelihood of developing asthma (Kozyrskyj et al, 2010). These populations could be advised to avoid outdoor vegetated areas like Boyd or Buccleuch Parks on days with high pollen or other trigger elements. However, at the same time, exposure to greenspace has been shown specifically to assist the development of feelings of well-being in children, helping them to learn emotional and behavioral connections to nearby natural and social environments (Kahn and Kellert). Exposure to nature has also been shown to reduce symptoms of Attention Deficit Hyperactive Disorder in children (Taylor and Kuo, n.d.).

If consuming fish with higher levels of metals and PCB is harmful to health, then it is likely that lower income and older populations are at higher risk, as these populations tend to actually eat the fish the catch rather than throwing them back. Burger (2002) found in a study of fishermen on the James River in Virginia that consumption patterns were negatively correlated with mean income and positively correlated with mean age.

### ***Community Context***

It is clear that people currently fish in the Raritan River, mostly from Boyd Park. As far as we could determine, there are no studies about the extent of fishing or surveys of fishermen to determine how often they fish and how much fish they consume. In the research for this HIA, we were also unable to locate any recent studies that sampled the fish in the Raritan River in the vicinity of New Brunswick to test for toxicity. One limited study took samples in 2006-07 and found that while only a few samples exceeded high action levels, the majority did exceed various risk-based (human health) thresholds (utilized by the State) and in many cases, the individual specimens exceeded thresholds for several contaminants (Ruppel et al, 2008).

Regarding exposures to rodents, insects and weeds along the waterfront, our survey showed that people are concerned about maintenance and cleanliness. About 65 percent of respondents said that they would come to the waterfront areas more if they were cleaner and better maintained.





*Fisherman along waterfront in Boyd Park*

### ***Findings and Recommendations***

If more people spend time at Boyd Park and in other vegetated areas along the waterfront, perhaps in particular the conservation area, those who are sensitive to allergens and/or have asthma may experience aggravated respiratory symptoms. Also, there is an opportunity for people to receive insect and tick bites or be subject to animal attacks or bite, especially in garbage strewn or weed-infested areas. Also, while fishing can be a very calming and healthy activity, if fishermen consume the fish they catch in the Raritan, there are potential negative health outcomes that could be more serious for high risk populations like children, the elderly and pregnant women.

In light of these potential health impacts, suggested recommendations include:

- Maintain paths and open areas free of garbage.
- Respond quickly to animal complaints, and work with local animal rescue organizations on a solution to feral cats.
- Keep weeds to a minimum and remove poison ivy.
- Consider natural ways to minimize ticks and mosquitoes.
- Provide ample shade, where possible to encourage physical activity during hot months and reduce the exposure to sun and heat.
- Provide clear signage in English and Spanish about safety of fish consumption and where to find information about current fish consumption advisories.
- Consider providing education to fishermen about fish species and safe consumption.
- Support additional research about fishing habits, fishermen and fish consumption.

## **HEALTH DETERMINANT: SOCIAL INTERACTION**

### ***Connections to Health***

Social interaction is created by bringing members of a community together for purposes that strengthen the sense of trust and support for other members of that community. It helps people to feel that they live in and belong to a socially cohesive group, and a range of activities and resources can emerge as a

consequence of those ties. Research has shown that Individuals with high “social capital” tend to live longer, and are mentally and physically healthier (Ross et al, 2007).

Having public spaces to gather and recreate, particularly those that can be focal points for an area in terms of beauty and expression of the character of a place like the Raritan River waterfront could be for New Brunswick, can improve social capital by creating places for formal and informal social interactions. Success in building social cohesion can then lead to greater civic pride and involvement. Holt-Lunstad, Smith, and Layton (2010) found that a lack of social relationships is comparable to alcohol and tobacco use as a risk factor for mortality and is even more influential than risk factors like obesity and physical inactivity.



Music event held at Boyd Park (Hub City Sounds, Youtube)

Numerous studies have shown that stress can be moderated through protective factors related to social support and the creation of social networks, social capital and social cohesion. Reducing stress improves quality of life and reduces health outcomes like hypertension and heart attacks. Kawachi and Berkman (2000) found that people who self-reported severe lack of social support were more than twice as likely to report fair or poor health than people who did not lack social support. A qualitative study in Australia demonstrated a strong link between neighborhood parks and social networks/capital. Participants of the study saw the parks as “places to create contact and community” and an important place to establish and maintain networks (Baum and Palmer 2002).

### ***Vulnerable Population***

Social cohesion would have the greatest positive impact to those with fewer individual resources because it provides a support system, as neighbors can lean on each other in times of need. In terms of age, low social cohesion has been associated with lower self-rated health of teenagers and children, higher levels of depression, and increases in the presence of hyperactivity and emotional disorders (Abada et al., 2007).

Due to physical and mobility limitations, senior citizens may feel too intimidated to use the waterfront areas or to travel there. However, some older adults live isolated lives and are most in need of opportunities to build social networks. Benches, shaded areas, and well-located public facilities may offer a respite for senior citizens as they utilize the paths or enjoy nature.

### ***Community Context***

There are currently several large events held at Boyd Park each year, utilizing the amphitheater for music and plays, and the large open area for festivals. However, the events do not draw large crowds and there is potential for more events of different types to be held. Survey results showed that the top desired activity at waterfront parks was more events, such as music and arts festivals. Promoting the waterfront area as a space for various types of social gatherings, large and small, is an area of potential. Possible development of a dining establishment or even food trucks, creates a focal point for bringing out more people for social interaction.

Survey comments included:

*“Parks should be used for good charity causes....MORE WALKS IN THE PARKS for CHARITY organizations. It's an easy way for everyone to come together, explore the park together and take some great pictures of our city parks.”*

*“I think that little cafes or a nice restaurant in each (park) would also bring more people.”*

### ***Findings and Recommendations***

Social cohesion contributes to health in many positive ways. More and improved recreational open space created by the implementation of the MPAP should provide opportunities for social interaction that improves community quality of life and mental health of residents. There is a demand for more social events and amenities to support them. Improvements to public access have the added benefit of potentially decreasing perceived and real crime rates through improved informal social control.

To enhance the positive health benefits of social interaction while implementing the MPAP, recommendations include:

- Host more community events at Boyd and Buccleuch Parks that cater to community members from diverse backgrounds.
- Encourage community leaders to take ownership of events and hold them on a regular basis.
- Create opportunities for traditionally marginalized members of the community, particularly Hispanic populations and senior citizens to utilize the Raritan waterfront areas, including supportive amenities like benches, picnic tables and accessible restrooms.
- Create new spaces and enhance existing spaces, like the amphitheater, where community members could convene meetings and hold events.
- Foster creation of a Raritan Waterfront Community Advisory Board or “Friends” group made up of residents and other stakeholders to function as an organizing body for projects to help keep the area safe and clean as well as organizing regular community events, which promote social cohesion.

- Develop a public involvement plan to periodically survey and elicit feedback from New Brunswick residents on ideas to create more events and programming.
- Improve picnicking and gathering spaces (grills, tables), and provide adequate, accessible restrooms and water fountains.
- Encourage a partnership with local artists to design something unique to the community and history of the area, and consider locations for murals.
- Design places for relaxation and meditation.
- Consider fostering new social networking opportunities for residents such as walking clubs and hobby-based clubs, such as bird-watching, nature-oriented art or kayaking.

## **HEALTH DETERMINANT: LOCAL ECONOMIC ACTIVITY**

### ***Connections to Health***

Increased public access to Raritan waterfront areas, if successful in bringing more people to use the area, can affect the local economy in several ways. A healthier local economy can impact health incomes in the form of more jobs and income that give more people access to health insurance and reduce stress in their lives, improving overall well-being.

One economic stimulus is local purchases. When people leave their homes to access the waterfront parks and pathways, they may combine their visit with a purchase of food or drink from a local store as refreshment. Several studies have showed that increased foot-traffic from installation of bicycle and pedestrian friendly improvements have equated to increased business (Clifton et al, 2012). They may also purchase equipment that they would not have purchased without the opportunity to use it on the waterfront paths and parks, such as bicycles, roller blades and skateboards. In one study of a trail (Virginia Creeper Trail) that draws users from outside the local region, it was estimated that each visitor to the trail spent between \$23-\$38 per trip (Bowker et al, 2007).

Another local economic stimulus is related to property values. Research has shown that areas for recreation, such as parks and trails, increase property values for the surrounding residential properties, and ultimately increase tax revenues for the municipalities (Reed, 2012; Crompton and Nichols, 2006; Active Living, 2010). These property value increases total asset value for homeowners and also can bring more tax revenue to the local municipality. The downside of increasing land values is that if gentrification occurs, some lower income individuals and renters may face housing cost increases that drive them from the area.

Eco-tourism opportunities are another way to support local businesses and improve property values. Tourists may drive to use the Raritan waterfront area and then choose to eat or shop with local vendors, creating local jobs and increasing the attractiveness of the community for economic activity. More than 400,000 jobs statewide in New Jersey are linked to the tourism industry, so using public access areas in ways that promote access for boats, boat tours and paths and blinds for wildlife watching has the potential to encourage tourism (Krizek and Johnson, 2006).



People can stop for snacks or supplies along George St. on their way to the Raritan waterfront.

If the riverfront serves as a destination, it results in “purposeful walking” rather than merely recreational walking or no walking. When destinations are effectively linked within walking or biking distance to other amenities like transit, restaurant and retail, it stimulates and incentivizes both active transportation and economic activity (Frank and Pivo, 1994).

### ***Vulnerable Populations***

Property value increases can be good for most residents in terms of the value of their assets, but for renters and low-income households, it can also result in higher rents and taxes that can displace these populations. Displacement can have a strong effect on health disparities, especially for the poor, women, children, the elderly, and racial minorities (CDC, 2012). However, new jobs created in the service sector (shops and restaurants) near the Raritan waterfront, in walking distance of many lower-income residents, might disproportionately benefit these populations as well.

### ***Community Context***

An upgraded Raritan waterfront could potentially draw visitors from the larger region who may spend these amounts. A typical local resident is unlikely to spend this much per trip, but might more likely spend \$5-10 on snacks and beverages. So even taking a conservative figure like \$5 per person, an event that draws 2,000 people to Boyd Park could generate \$10,000 in local economic benefit in one day.

Survey comments and answers indicate that New Brunswick residents would welcome more economic activity associated with waterfront activities like kayak rentals, and events that include local restaurants serving food, or even installation of a new restaurant or café close to the waterfront (built with resilience from flooding).

Some comments included:

*“It would be fun to have tourist boating opportunities to entertain friends and visitors to New Brunswick with short boating trips (an hour or 2 in duration)”*

*“I would love to have a restaurant built her the river with open air decks for the summer and nice views in the winter...”*

Comments about park amenities during the community needs assessment indicated a need/interest in more picnic areas possibly with barbecue stations and more benches throughout the park. Presently, picnic tables and pavilions are only available below Commercial Avenue near the Rutgers Boathouse, and there are no barbecue stations. Also, there are only two benches near the New Street entrance to the park with all other seating south of the amphitheater.

Table 26.

Do you buy any of the following from local stores to take with you to Boyd Park? (n = 58)

Question	Often	Sometimes	Rarely	Never
<b>Beverages</b>	5.2%	25.9%	6.9%	62.1%
<b>Candy/snacks</b>	3.5%	8.8%	12.3%	75.4%
<b>Sandwiches</b>	1.8%	12.5%	16.1%	69.6%
<b>Meals</b>	1.8%	8.9%	16.1%	73.2%
<b>Other</b>	5.3%	0.0%	5.3%	89.5%

Table 27.

Do you buy any of the following from local stores to take with you to Buccleuch Park? (n = 64)

Question	Often	Sometimes	Rarely	Never
<b>Beverages</b>	8.1%	30.6%	4.8%	56.5%
<b>Sandwiches</b>	7.8%	21.9%	12.5%	57.8%
<b>Meals</b>	3.3%	18.0%	16.4%	62.3%
<b>Candy/snacks</b>	1.6%	11.3%	9.7%	77.4%
<b>Other</b>	4.0%	0.0%	4.0%	92.0%

As noted above, some of the increased number of people accessing the Raritan waterfront will purchase food or drink from local businesses. About 30 to 40 percent of our survey respondents reported that they sometimes or often buy beverages to take long to either Boyd or Buccleuch parks, and roughly 15 percent said that they at least sometimes purchase sandwiches. With enhanced picnicking areas and amenities that encourage longer stays, that percentage would likely increase.

***Findings and Recommendations:***

Research shows that stimulating the local economy brings jobs and income, leading to reduced stress and improved health outcomes associated with reduced stress and improved quality of life. Uses of the riverfront areas that promote local businesses can help to promote local economic growth.

To maximize the impacts of local economic activity on health, recommendations include:

- Encourage increased purchases from and patronization of local businesses by users of the Raritan waterfront.
- Foster enhanced usage and promotion of the waterfront parks and paths by local hotels, employers and Rutgers University.
- Develop and encourage use of bike and pedestrian-friendly activity loops that connect the waterfront areas to downtown and local businesses.
- Encourage partnerships, contests or incentives that support local business.
- Use the Raritan waterfront as a key feature in New Brunswick's ongoing revitalization efforts and help to further 'brand' and sell the city as a great place to live, work, and visit. As the TPL report noted "the outstanding resource of the Raritan River is not fully capitalized" (TPL, 2011).
- Follow the 2013 New Brunswick Economic Development Overview recommendation to enhance access to the River waterfront across Route 18 from downtown and designation of an urban enterprise zone (UEZ 2012) across from the park to encourage jobs, restaurants, etc in the area.
- Work with City Market and other local civic and development organizations to coordinate events and programs that bring more people to the area and tie into activities along or on the River. As more synergies and connections are made, it will only increase healthy outcomes and add to the economic success of the area.
- Consider promotion of the "River Conservation Zone" as an area for passive recreation along the river's edge, fishing and scenic walkway to attract eco-tourists from outside the region.
- Continue coordination and discussion between the City of New Brunswick and Rutgers University in use of the Rutgers University Boat House and boat ramp to serve as a community center, rental facilities for meetings or events, and possible public access boat storage.
- Create a special recognition program for businesses and properties that encourage walking, bicycling, and use of the Raritan parks and walkways.
- Install additional signage, where appropriate, with information that can add visual interest to the Raritan pathway and encourage usage by engaging users.
- Create opportunities for businesses to participate in riverfront events and sponsorships, like fairs or 5K runs for charity.
- Encourage opportunities to increase assets for existing residents. Examples of opportunities include homeownership programs and workforce development initiatives.

## VI. SUMMARY OF FINDINGS WITH RECOMMENDATIONS

Table \_\_.

HIA Analysis – Summary of Findings: Health Impacts of the New Brunswick MPAP

<b>Health Determinant</b>	<b>Direction of Expected Health Impact</b>	<b>Degree of Impact</b>	<b>Likelihood</b>	<b>Subpopulation Impacted</b>
<b>Safety - Accidents</b>	Negative	High	Possible	Minorities Lower Income Youth
<b>Safety - Crime</b>	Negative	Medium	Unlikely	Women Elderly
<b>Outdoor Activity – Greenspace</b>	Positive	High	Likely	Lower Income Children
<b>Outdoor Activity – Other Exposures</b>	Neutral	Low	Unlikely	Children Fishermen
<b>Social Interaction</b>	Positive	Medium	Possible	Elderly Youth
<b>Local Economic Activity</b>	Neutral	Low	Unclear	Lower Income

<i>Direction of Impact</i>	
<b>Negative</b>	Negative health impacts associated with this determinant
<b>Neutral</b>	Some positive and some negative impacts
<b>Unknown</b>	Unknown how health will be impacted
<b>Positive</b>	Positive health impacts associated with this determinant

<i>Degree of Impact</i>	
<b>Low</b>	Causes minor impacts
<b>Medium</b>	Causes some substantial impacts
<b>High</b>	Causes significant impacts

<i>Likelihood</i>	
<b>Likely</b>	Likely that impacts will occur
<b>Possible</b>	Possible that impacts will occur
<b>Unlikely</b>	Unlikely that impacts will occur
<b>Unclear</b>	Unclear whether impacts will occur



## *Summary of Recommendations:*

### **Safety – Accidents and Hazards**

- Improved fencing and water safety signage in English and Spanish will increase safety for all and, in particular, younger children.
- A water safety education program, offered in both English and Spanish and targeted toward lower-income and immigrant populations, could be effective in increasing knowledge and awareness to prevent drowning. The program should highlight the dangers of flooded rivers.
- For boaters, messaging should encourage adult life jacket wear in the company of children and youth.
- Water and boat safety should be presented in programs and found on signs, particularly regarding anti-alcohol for boat operators.
- Local rescue personnel should be trained for waterfront and on-the-water rescues.
- Programming and events that are specific to seniors and children like chaperoned walks, will help to address safety concerns of these groups.
- An assessment of the safety of road intersections along common access routes, and of waterfront path conditions would help to prioritize locations for improvements. Where possible, retrofit existing streets for safer pedestrian and bicycle crossing and improve off-street paths related to public access.
- Reducing potential collisions and injuries will require education and awareness of proper pathway use (following etiquette, staying to the right, yielding to pedestrians, etc.). For cyclists, defensive riding (giving the person warning you are passing, slowing speeds, obeying rules of the road, etc.) is important.

### **Safety – Crime**

- Maintain consistent lighting of pathways and gathering areas in evening hours.
- Install signs that are visible and readable, with information related to crime prevention techniques and reporting.
- Install “where are you?” signs along pathway to indicate proximity to endpoints or landmarks and to improve the quality of response to any emergency calls, and users’ knowledge of their location.
- Consider installation of call boxes in Boyd Park and along pathway (and conservation area, if a pathway is eventually constructed).
- Implement continued local police patrol, particularly at certain times of day when more vulnerable population may be using the area.
- Consider locations for surveillance cameras and/or “mock” cameras that are marked by signs.
- Implement CPED, where possible, such as in places with heavy vegetation, where strategic cutting can help to reduce feelings of isolation.
- As the waterfront pathway improvements are implement, encourage a local “Raritan waterfront watch” program, modeled after successful “neighborhood watch” programs.
- Work with local social service agencies to address the homeless population. Encourage the elimination of litter, graffiti, and deteriorated property conditions (weeds, broken windows, etc.)

## Outdoor Activity - Greenspace

- Develop and maintain Raritan waterfront open space for maximum functioning to support active physical recreation such as walking, jogging, bicycling and kayak access.
- Consider setting aside some space on or surrounding waterfront areas for development of passive recreation (benches, picnic areas, bird blinds).
- New Brunswick can work towards improving connections and wayfinding to Riverfront locations from downtown and residential areas in order to direct the maximum pedestrian users to the area.
- Assure safe access routes from underserved neighborhoods.
- Consider developing an exercise loop within the public access area.
- Collaborate with the local bicycling organizations to bring cycling education to New Brunswick, especially children, to encourage use of the River pathway.
- Design paths and spaces for active use by multiple modes and consider more recreational programming.
- Provide opportunities for physical activities for all age groups (children, adolescents, adults, and older adults).
- Provide a parking facility for bicycles, a bicycle share or lending program (with helmets), and bicycle safety education classes; provide education for cyclists, pedestrians, and motorists on the rules of the road.
- Consider one or more basketball courts and open grassy areas and play fields where exercise programs could be held.

## Outdoor Activity – Other Exposures

- Maintain paths and open areas free of garbage.
- Respond quickly to animal complaints, and work with local animal rescue organizations on a solution to feral cats.
- Keep weeds to a minimum and remove poison ivy.
- Consider natural ways to minimize ticks and mosquitoes.
- Provide ample shade, where possible to encourage physical activity during hot months and reduce the exposure to sun and heat.
- Provide clear signage in English and Spanish about safety of fish consumption and where to find information about current fish consumption advisories.
- Consider providing education to fishermen about fish species and safe consumption.
- Support additional research about fishing habits, fishermen and fish consumption.

## Social Interaction

- Host more community events at Boyd and Buccleuch Parks that cater to community members from diverse backgrounds.
- Encourage community leaders to take ownership of events and hold them on a regular basis.
- Create opportunities for traditionally marginalized members of the community, particularly Hispanic populations and senior citizens to utilize the Raritan waterfront areas, including supportive amenities like benches, picnic tables and accessible restrooms.
- Create new spaces and enhance existing spaces, like the amphitheater, where community members could convene meetings and hold events.

- Foster creation of a Raritan Waterfront Community Advisory Board or “Friends” group made up of residents and other stakeholders to function as an organizing body for projects to help keep the area safe and clean as well as organizing regular community events, which promote social cohesion.
- Develop a public involvement plan to periodically survey and elicit feedback from New Brunswick residents on ideas to create more events and programming.
- Improve picnicking and gathering spaces (grills, tables), and provide adequate, accessible restrooms and water fountains.
- Encourage a partnership with local artists to design something unique to the community and history of the area, and consider locations for murals.
- Design places for relaxation and meditation.
- Consider fostering new social networking opportunities for residents such as walking clubs and hobby-based clubs, such as bird-watching, nature-oriented art or kayaking.

### Local Economic Activity

- Encourage increased purchases from and patronization of local businesses by users of the Raritan waterfront.
- Foster enhanced usage and promotion of the waterfront parks and paths by local hotels, employers and Rutgers University.
- Develop and encourage use of bike and pedestrian-friendly activity loops that connect the waterfront areas to downtown and local businesses.
- Encourage partnerships, contests or incentives that support local business.
- Use the Raritan waterfront as a key feature in New Brunswick’s ongoing revitalization efforts and help to further ‘brand’ and sell the city as a great place to live, work, and visit. As the TPL report noted “the outstanding resource of the Raritan River is not fully capitalized” (TPL, 2011).
- Follow the 2013 New Brunswick Economic Development Overview recommendation to enhance access to the River waterfront across Route 18 from downtown and designation of an urban enterprise zone (UEZ 2012) across from the park to encourage jobs, restaurants, etc in the area.
- Work with City Market and other local civic and development organizations to coordinate events and programs that bring more people to the area and tie into activities along or on the River. As more synergies and connections are made, it will only increase healthy outcomes and add to the economic success of the area.
- Consider promotion of the “River Conservation Zone” as an area for passive recreation along the river’s edge, fishing and scenic walkway to attract eco-tourists from outside the region.
- Continue coordination and discussion between the City of New Brunswick and Rutgers University in use of the Rutgers University Boat House and boat ramp to serve as a community center, rental facilities for meetings or events, and possible public access boat storage.
- Create a special recognition program for businesses and properties that encourage walking, bicycling, and use of the Raritan parks and walkways.
- Install additional signage, where appropriate, with information that can add visual interest to the Raritan pathway and encourage usage by engaging users.

- Create opportunities for businesses to participate in riverfront events and sponsorships, like fairs or 5K runs for charity.
- Encourage opportunities to increase assets for existing residents. Examples of opportunities include homeownership programs and workforce development initiatives.

## **VII. EVALUATION AND FUTURE RESEARCH**

In this final section, a comprehensive HIA typically includes both a process and an impact evaluation, with recommended monitoring plan. With a desktop or “rapid” HIA, it is difficult to evaluate process because of the limited engagement with stakeholders who could serve to evaluate the process. In this HIA, we perform a process evaluation by recognizing that the process adhered to basic HIA practice standards, and that the report clearly describes how the process steps were carried out.

As with a process evaluation, external evaluators often conduct impact evaluations, determining how effective HIAs are in influencing the policy decisions that they were intended to inform. Since the MPAP was adopted coincidentally with the completion of this HIA, it is not yet possible to see the impacts, or the reaction of decision-makers to the recommendations of the HIA. Thus, while impacts usually can’t be included in a desktop HIA report, it is important to recommend that an organization take responsibility to monitor and document impacts after the final report is complete.

### *Monitoring Plan for Evaluating Health Outcomes*

HIA outcome evaluations examine the effects of HIAs on health outcomes in the impacted population. While outcome evaluations are also usually outside of the scope of desktop or “rapid” HIAs, it is possible to identify potential indicators of relevant determinants of health and health outcomes that the policy, program or plan is predicted to impact.

As the MPAP is adopted and New Brunswick City Council decides to move forward with some or all of the recommendations contained in said report and accompanying HIA, it is paramount that management, monitoring, and evaluating mechanisms be established. Such mechanisms need to be established in order to properly manage, monitor, and measure the implementation of the HIA recommendations and their impact upon health.

To do so, this HIA recommends the following:

- Establish a Raritan Riverfront Advisory Committee. The committee could consist of public officials, private business owners, residents and employees, and representatives of local service and recreation agencies, and provide advice and support related to goals of the MPAP and recommendations from the HIA.
- Set up and hold public meetings with and distribute materials to residents and business and property owners about Raritan Public Access plans, and findings from the HIA, requesting feedback, and highlighting benefits for New Brunswick.

- Set up a stand-alone website or section on existing City website which contains all information surrounding the Raritan Riverfront.
- As recommendations are implemented, conduct regular surveys with residents, employees, students, business and property owners, and visitors to gather feedback surrounding implemented measures.
- Track active transportation as it relates to access to the waterfront and conduct traffic and user counts.
- With the assistance of the County health office, gather additional health metrics for New Brunswick residents, and share such data with the public via electronic and traditional methods.

Through the establishment of a dedicated committee and the employment of monitoring and evaluating mechanisms, New Brunswick will be able to obtain essential data that highlights if the MPAP has led to higher levels of physical and mental wellness. To the extent that recommendations from the HIA can be shown to have made a difference in health outcomes, those findings could be shared with other cities, counties, and planning and public health officials who are interested in researching, developing, and implementing HIAs related to public access planning.

### *Study Gaps and Constraints*

The literature cited in this report includes only a subset of the literature available on each topic, so it is possible that some sentinel studies were missed and are absent due to time limitations. Furthermore, some quantitative baseline data either did not exist at all, or was unavailable at a level lower than the state or region and therefore was inapplicable to the study area. Further, projections are based largely on qualitative assessment of the range of information collected and judgment of the research team, with limited stakeholder review.

Also, it is important to note that the health benefits and risks identified in this assessment may not materialize if no action is taken to implement the strategies described in the MPAP. Actual implementation of the MPAP goals and priorities will depend on a variety of factors including availability of funding; priorities and preferences of property owners and local decision-makers; and physical constraints.

The health determinants assessed in this study are only some of those that could have chosen. There are doubtless many other ways that public access enhancements could affect population health in the region. This HIA points the way to many other more detailed and rigorous studies that could delve into more aspects of health and could explore more deeply those that were presented in this HIA.

### *Future Research*

Some of the future research that could continue to inform decision-makers and stakeholders about the health impacts of decisions about public access include:

- Evaluate the degree to which access to parks and pathways along the River meet the needs of the existing and future population, and evaluate whether improved access, and the resulting health benefits, are equitably distributed geographically and demographically.
- Address gaps in our current knowledge of drowning prevention.

- Improve understanding of river users' attitudes and knowledge about the risks and hazards present in rivers.
- Assess safety of road intersections and path conditions along the access routes to the waterfront to help to prioritize locations for improvements.
- Research the incidence of water-related accidents, causes and prevention
- Monitor the number of users, purpose for use, and activity levels along the enhanced riverfront pathway and parks.
- Survey and study fishermen to obtain more knowledge about fishing habits and consumption.
- Sample and test fish that are consumed by Raritan fisherman for toxicity.
- Complete an analysis on the real estate and economic impacts of the improved Raritan riverfront.

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## **Appendix**

### **Survey Instrument**

#### **New Brunswick Municipal Public Access Plan and Health Impact Assessment**

### Parks Usage Questions

You are invited to participate in a research study that is being conducted on behalf of the City Of New Brunswick by the Bloustein School of Planning and Public Policy at Rutgers University. The purpose of this research is to determine the public's needs and wants as they relate to access to and use of the parks and public spaces adjacent to the Raritan River and the Lawrence Brook in New Brunswick, NJ and the public's understanding of how climate change may impact the river and surrounding areas.

This research is anonymous. Anonymous means that there will be no information recorded about you that could identify you. There will be no linkage between your identity and your response in the research. If you agree to take part in the study, you will be assigned a random code number that will be used on the questionnaire.

The project team and the Institutional Review Board at Rutgers University are the only parties that will be allowed to see the data, except as may be required by law. If a report of this study is published, or the results are presented at a professional conference, only group results will be stated. All study data will be kept for three years.

The survey should take approximately 5 to 10 minutes to complete. There will be approximately 150 participants from the City of New Brunswick in this survey.

There are no foreseeable risks to participation in this study. In addition, you may receive no direct benefit from taking part in this study.

**Participation in this study is voluntary. You may choose not to participate, and you may withdraw at any time during the survey without any penalty to you. In addition, you may choose not to answer any questions with which you are not comfortable.**

If you have any questions about the study or study procedures, you may contact Sara Malone, 33 Livingston Ave. New Brunswick, NJ 08901, sjmalone@ejb.rutgers.edu, 848.932.2720.

If you have any questions about your rights as a research subject, please contact an IRB Administrator at the Rutgers University, Arts and Sciences IRB:

Institutional Review Board  
 Rutgers University, the State University of New Jersey  
 Liberty Plaza / Suite 3200  
 335 George Street, 3rd Floor  
 New Brunswick, NJ 08901  
 Phone: 732-235-9806  
 Email: humansubjects@orsp.rutgers.edu

**If you are 18 years of age or older, understand the statements above, and will consent to participate in the study, click on the "I Agree" button to begin the survey/experiment. If not, please click on the "I Do Not Agree" button and you will exit this program.**

- I Agree
- I Do Not Agree

### How often have you used the following waterfront parks along the Raritan River?



	Never	1 or 2 times before	1 or 2 times a year	1 or 2 times a month	Once a week	2 to 3 times a week	Daily
Buccleuch Park (#1 above)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
Boyd Park (#3 above)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
Deiner Park (#21 above)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>

**The following questions apply to Buccleuch Park only.**

**For Buccleuch Park, what are the three most important factors you consider when you decide whether or not to use this park? (Drag and drop the answers, with the most important at the top).**

<p><b>Items</b></p> <ul style="list-style-type: none"> <li>Distance from my home</li> <li>How easy it is to get there</li> <li>Weather</li> <li>Security / safety</li> <li>Recreational amenities (like playgrounds or exercise equipment)</li> <li>Social amenities (like grills, covered shelters, bathrooms)</li> <li>Natural scenery</li> <li>Programmed activities</li> <li>Other, please list</li> </ul>	<p style="text-align: center;"><b>Most important</b></p> <hr/> <p style="text-align: center;"><b>Next most important</b></p> <hr/> <p style="text-align: center;"><b>Third most important</b></p>
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**How are you most likely to get to Buccleuch Park?**

- Walk, indicate what route you take (e.g., I cut across campus from George St. to Morrell St. to Wyckoff St.).
- Bicycle, indicate what route you take (e.g., I take Hamilton to Easton to Wyckoff St.).
- Car
- Public Transportation
- Other: \_\_\_\_\_

**For what purposes do you use Buccleuch Park?**

	Often	Sometimes	Rarely	Never
Fitness	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Social - meeting or visiting people	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Picnicking	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Getting to work or school	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Getting to shopping or errands	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Viewing scenery and wildlife	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Going to a festival or event	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
To work on artistic activities such as painting, photography or music	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other, please list _____	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**When you visit Buccleuch Park, how long are you normally there?**

- Less than half an hour
- Half an hour to one hour
- One to two hours
- More than two hours

**Do you usually use Buccleuch Park by yourself or with others?**

- By myself
- With 1 or 2 other people
- In a larger group

**Do you think Buccleuch Park is safe during the following times of the day?**

	Yes	No	Don't know
6 to 8 am	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8 am to noon	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
noon to 5 pm	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5 to 9 pm	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**If you answered "no" to any of the time frames in the previous question, why do you feel the park is unsafe during those times? Select all that apply.**

- Poor lighting
- The park seems isolated.
- I'm afraid of crime.
- I'm afraid of being near the water.
- There is no one around.
- Other:

**Do you buy any of the following from local stores to take with you to Buccleuch Park?**

	Often	Sometimes	Rarely	Never
Beverages	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Candy/snacks	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sandwiches	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Meals	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**The following questions apply to Boyd Park only.**

**For Boyd Park, what are the three most important factors you consider when you decide whether or not to use this park? (Drag and drop the answers, with the most important at the top).**

<p><b>Items</b></p> <ul style="list-style-type: none"> <li>Distance from my home</li> <li>How easy it is to get there</li> <li>Weather</li> <li>Security / safety</li> <li>Recreational amenities (like playgrounds or exercise equipment)</li> <li>Social amenities (like grills, covered shelters, bathrooms)</li> <li>Natural scenery</li> <li>Programmed activities</li> <li>Other, please list</li> </ul>	<p style="text-align: center;"><b>Most important</b></p> <hr/> <p style="text-align: center;"><b>Next most important</b></p> <hr/> <p style="text-align: center;"><b>Third most important</b></p>
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**How are you most likely to get to Boyd Park?**

- Walk, indicate what route you take (e.g., I take George St. to New St and enter the park there).
- Bicycle, indicate what route you take (e.g., I take Remsen to Sanford to Commercial and enter the park there).
- Car
- Public Transportation
- Other:

**For what purposes do you use Boyd Park?**

	Often	Sometimes	Rarely	Never
Fitness	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Social - meeting or visiting people	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Picnicking	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Getting to work or school	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Getting to shopping or errands	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fishing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Viewing scenery and wildlife	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Going to a festival or event	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Boating (including canoe & kayaks)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
To work on artistic activities such as painting, photography or music	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other, please list <input style="width: 100px;" type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**When you visit Boyd Park, how long are you normally there?**

- Less than half an hour
- Half an hour to one hour
- One to two hours
- More than two hours



**Do you usually use Boyd Park by yourself or with others?**

- By myself
- With 1 or 2 other people
- In a larger group

**Do you think Boyd Park is safe during the following times of the day?**

	Yes	No	Don't know
6 to 8 am	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8 am to noon	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
noon to 5 pm	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5 to 9 pm	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**If you answered "no" to any of the time frames in the previous question, why do you feel the park is unsafe during those times? Select all that apply.**

- Poor lighting
- The park seems isolated.
- I'm afraid of crime.
- I'm afraid of being near the water.
- There is no one around.
- Other:

**Do you buy any of the following from local stores to take with you to Boyd Park?**

	Often	Sometimes	Rarely	Never
Beverages	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Candy/snacks	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sandwiches	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Meals	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**The following questions apply to Deiner Park only.**

**For Deiner Park, what are the three most important factors you consider when you decide whether or not to use this park? (Drag and drop the answers, with the most important at the top).**

<p><b>Items</b></p> <ul style="list-style-type: none"> <li>Distance from my home</li> <li>How easy it is to get there</li> <li>Weather</li> <li>Security / safety</li> <li>Recreational amenities (like playgrounds or exercise equipment)</li> <li>Social amenities (like grills, covered shelters, bathrooms)</li> <li>Natural scenery</li> <li>Programmed activities</li> <li>Other, please list</li> </ul>	<p style="text-align: center;"><b>Most important</b></p> <hr/> <p style="text-align: center;"><b>Next most important</b></p> <hr/> <p style="text-align: center;"><b>Third most important</b></p>
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**How are you most likely to get to Deiner Park?**

- Walk, indicate what route you take (e.g., I cut across campus from College to George behind the Alexander Library and enter the park behind Campbell Hall).
- Bicycle, indicate what route you take (e.g., I take Hamilton to George to the entrance behind Campbell Hall).
- Car
- Public Transportation
- Other:

**For what purposes do you use Deiner Park?**

	Often	Sometimes	Rarely	Never
Fitness	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Social - meeting or visiting people	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Picnicking	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Getting to work or school	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Getting to shopping or errands	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Viewing scenery and wildlife	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Going to a festival or event	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
To work on artistic endeavors such as painting, photography or music	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other, please list <input style="width: 100px;" type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**When you visit Deiner Park, how long are you normally there?**

- Less than half an hour
- Half an hour to one hour
- One to two hours
- More than two hours

**Do you usually use Deiner Park by yourself or with others?**

- By myself
- With 1 or 2 other people
- In a larger group

**Do you think Deiner Park is safe during the following times of the day?**

	Yes	No	Don't know
6 to 8 am	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8 am to noon	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
noon to 5 pm	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5 to 9 pm	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**If you answered "no" to any of the time frames in the previous question, why do you feel the park is unsafe during those times? Select all that apply.**

- Poor lighting
- The park seems isolated.
- I'm afraid of crime.
- I'm afraid of being near the water.
- There is no one around.
- Other:

**Do you buy any of the following from local stores to take with you to Deiner Park?**

	Often	Sometimes	Rarely	Never
Beverages	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Candy/snacks	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sandwiches	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Meals	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Would you use Buccleuch, Boyd or Deiner parks (or if you currently use them, would you use them more) if:**

	Yes	No	Maybe
There were more special events, like music or art festivals	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
There were safer and easier ways to get there by foot or bicycle	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
There was better / more parking nearby	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
There were more benches and picnic tables	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
There were grills and covered picnic shelters	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
They had canoe, kayak or paddleboarding rentals	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
There were food concession stands or restaurants	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
There was improved safety against crime (lighting, patrols, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
There was better disability (ADA) access	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
They were cleaner and better maintained	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
There were better water safety protections	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**How often have you used the following open space areas along the Raritan River or Lawrence Brook?**



	Never	1 to 2 times before	1 to 2 times a year	1 to 2 times a month	Once a week	2 to 3 times a week	Daily
City Open Space - Raritan River Conservation Area (#22 above)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
County Open Space - Raritan River Conservation Area (#23 above)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
Weston's Mill Watershed (#24 above)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>

**What types of things would you like to do in these New Brunswick open space areas if they had better public access? And how often would you do them?**

	Often	Sometimes	Rarely	Never
Swimming or wading	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Kayaking or canoeing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Paddleboarding	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fishing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Boating/sailing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Birding	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Nature study	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Open air art classes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Exercise stations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Dog run	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fishing instructions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Guided river tours	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Water safety instructions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**What is the importance of community open space to you? Select all that apply.**

- I don't have a yard or enough space at my home for outdoor activities.
- Public parks have more amenities (e.g., playgrounds, trails, exercise equipment).
- I like interacting with other people.
- I like open space where I can be alone in nature.
- I like the events in community open spaces.
- I like open space where I can learn about and explore nature.
- Other, please describe

**Do you think you would get more physical activity if you had better access to the New Brunswick waterfront parks and related activities?**

- Yes
- Maybe
- No

**Do you think your mental health would improve if you had better access to the New Brunswick waterfront parks and related activities?**

- Yes
- Maybe
- No

**Boyd Park on the Raritan River sometimes floods during storms and these storms sometimes damage park amenities such as pathways, lighting and docks. How do you feel about the following statements?**

	Disagree	Neither Agree nor Disagree	Agree
Walls, levees or other hard barriers should be built to protect the park.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
All park amenities should be removed and the area should be open floodplain.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Restored wetlands should be built in the park to help control flood waters.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The park should be redesigned so that it is resilient to storm damage.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The final ship canal lock of the Delaware & Raritan Canal, which is located in Boyd Park, is historic and should be restored and protected.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**The dams at the Weston's Mill Pond prevent migrating fish from reaching their natural breeding grounds. Would you like to see improvements, such as fish ladders, installed to help migrating fish get over the dams?**

- Yes
- No
- Not sure, before I could answer I would need to know more about (fill in the blank):

**Do you fish along the waterfront in New Brunswick?**

- Yes
- No

**Do you eat the fish you catch?**

- Yes
- Sometimes
- No

**What other concerns or suggestions do you have about public access to and use of the parks, open space and trails along the Raritan River and Lawrence Brook in New Brunswick?**

**Finally, please tell us a little bit about yourself.**

**What is your age?**

- Under 18
- 18-34
- 35-54
- 55-74
- 75+

**What is your gender?**

- Male
- Female
- Other

**What is the highest level of education you've completed?**

- Did not graduate high school
- High school graduate (or GED)
- Some college (or technical vocation school/professional business school)
- Two-year college degree (AA: Associate in Arts)
- Four-year college degree (BA or BS: Bachelor of Arts/Science degree)
- Graduate work, but no advanced degree
- Graduate degree (Masters, PhD., Lawyer, Medical doctor)

**Which group(s) do you most closely identify with? Select all that apply.**

- American Indian and Alaska Native
- Asian
- Black or African American
- Hispanic or Latino
- Native Hawaiian or other Pacific Islander
- White
- Some Other Race - please list

**In general, my health is:**

- Excellent
- Very good
- Good
- Fair
- Poor

**I suffer from environmental allergies (ragweed, pollen, etc.):**

- All the time
- Often
- Sometimes
- Never

**Has your doctor advised you to increase your physical activity?**

- Yes
- No

**Have you EVER been told by a doctor or other health professional that you had...? (please check all that apply)**

- A heart condition
- Diabetes
- Asthma or other respiratory illness
- High blood pressure
- Obesity
- Depressive disorder
- None of the above

**During the past month, other than your regular job, did you participate in any physical activities or exercises such as running, calisthenics, sports, or walking for exercise?**

- Yes
- No

**If yes, how many times did you take part in this activity during the past month?**

- Once
- Twice
- 3-4 times
- More than 4 times

**Do you have a disability that limits your ability to walk and get around without the use of a cane, walker or wheelchair?**

- Yes
- No

**Please describe why you come to New Brunswick. Select all that apply.**

- I am a resident of New Brunswick
- I am a Rutgers student living on campus
- I work in New Brunswick
- I come to New Brunswick to shop, visit restaurants or attend cultural events
- I come to New Brunswick because of the businesses or hospitals
- Other, please list \_\_\_\_\_

**How long have you lived in New Brunswick?**

- Less than one year
- 1 to 2 years
- 3 to 5 years
- 6 to 9 years
- 10 to 20 years
- more than 20 years

**What type of residence do you live in? Is it a ...**

- One-family house detached from any house
- One-family house attached to one or more houses
- Building with 2 to 4 apartments
- Building with 5 to 19 apartments
- Building with 20 or more apartments
- Other, please list

**Have you ever had trouble getting to or out of your home in New Brunswick because of storm water?**

- Yes
- No

**Has your home in New Brunswick ever been flooded by storm water?**

- Yes
- No

**What street intersection is closest to your home?**

Street Name Number 1

Street Name Number 2

**Including yourself, how many people are in your household?**

- 1
- 2
- 3-4
- 5-6
- More than 6

**What is your total annual household income?**

- Less than \$25,000
- \$25,000 to \$49,999
- \$50,000 to \$99,999
- \$100,000 to \$149,999
- \$150,000 or more

*Thank you for your time in completing the survey.*