




BROCKTON TWO RIVERS MASTER PLAN

A Recreational Trail through the City

CITY OF BROCKTON | Mayor James E. Harrington | City Planner Nancy Stack Savoie

Hubert Murray Architect + Planner | July 2008





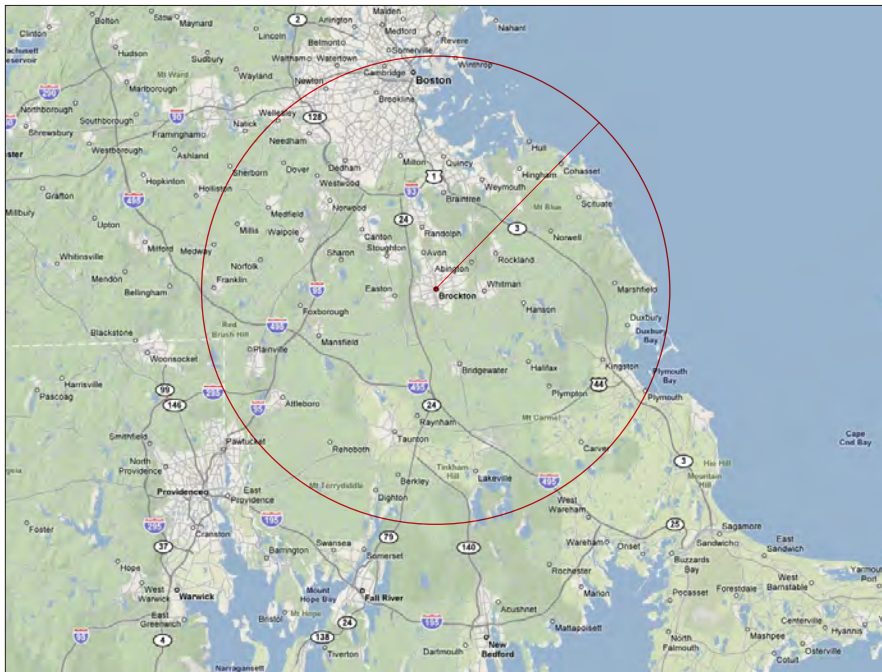
Introduction	01
Program Goals / Common Issues	03
Strategies for Action	07
Area Analyses and Proposals	19
Study Area 01	20
Study Area 02	26
Study Area 03	34
Study Area 04	44
Study Area 05	46
Implementation	48
References	52
Appendix Maps and Aerials	54

TABLE OF CONTENTS

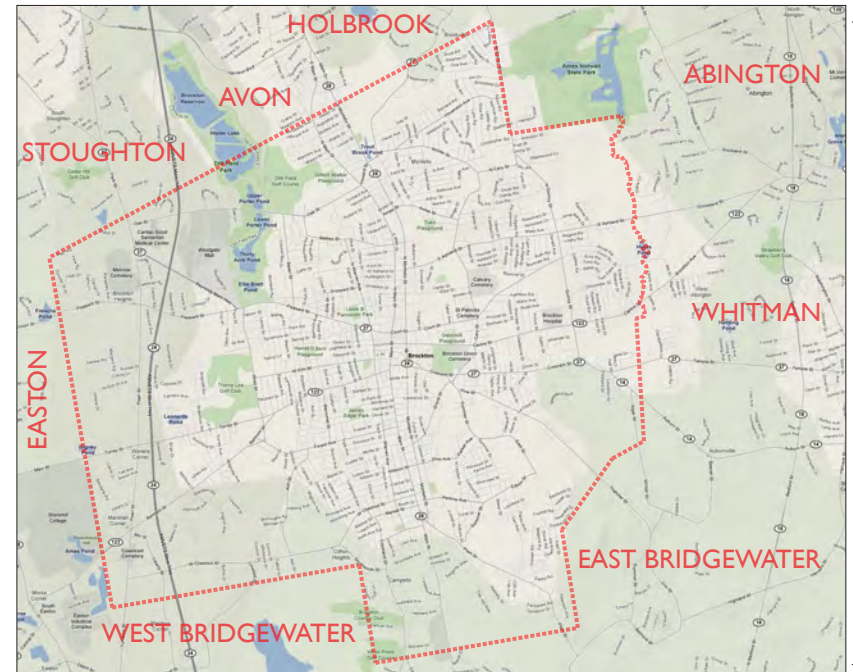
MASTER PLAN OVERVIEW

For a quick understanding of the Two Rivers Master Plan, read the Introduction (p.1) and Program Goals / Common Issues (p.3). Strategies for Action (pp.7-17) gives an overview of what needs to be done. Area Analyses and Proposals (pp. 19-47) goes into more detail. Implementation (p.48) indicates next steps and funding possibilities.

20 miles radius from Brockton



5.44 miles E-W



5.8 miles N-S

William L. Douglas, shoe manufacturer and retailer, was elected governor of the Commonwealth for the term 1905-1906.

Purpose

The purpose of this study is to provide an overview of the recreational and environmental potential for restoring and enhancing the urban environment through which Brockton's Two Rivers run. Trout Brook and Salisbury Brook are the two watercourses around which the city of Brockton has developed, treated variously as water source, drainage ditch and obstacle to be overcome. Rarely, to this day, were the two brooks viewed as an urban asset or as a source of recreation, culture and environmental replenishment for the residents and businesses that remain in the city.

Economically, Brockton has seen better days. In the decades straddling the turn of the 19th and 20th centuries, Brockton produced more men's shoes than anywhere else on the planet bringing with that industrial success rapid urban growth, plentiful employment and political influence at state level. A century later, Brockton manifests many of the signs of a long period of economic decline with its vacant properties, high unemployment rates and environmental degradation.

On the other hand, city government has managed to attract a number of government offices to provide local employment as well as attracting federal and state investment programs in housing, education and job training. The commuter rail link to Boston has been reestablished, complemented by an efficient bus transit system serving the metro-south area. To a limited extent, public investment has been supplemented by private investment, particularly in healthcare services (the city's largest employment sector) and to a much lesser extent in the building of a stadium for minor league baseball – as much cultural symbol as economic driver.

One thread in the continuing plan for attracting investment to the city is the objective to improve the quality of the public realm (streets, squares and open spaces, particularly downtown) and with that, on a broader canvas, the quality of the environment. The improvement of the overall quality of public space is intended in immediate terms to provide much needed amenities for residents and workers and in a broader frame of reference, to make the city a more attractive place in which to invest. Two significant

urban parks have been created in the center of the city as the beginnings of an urban open space system known as the Salisbury Greenway. Frederick Douglass Way (formerly High Street) has been upgraded and made more pedestrian friendly; and City Hall Plaza is in the process of being upgraded.

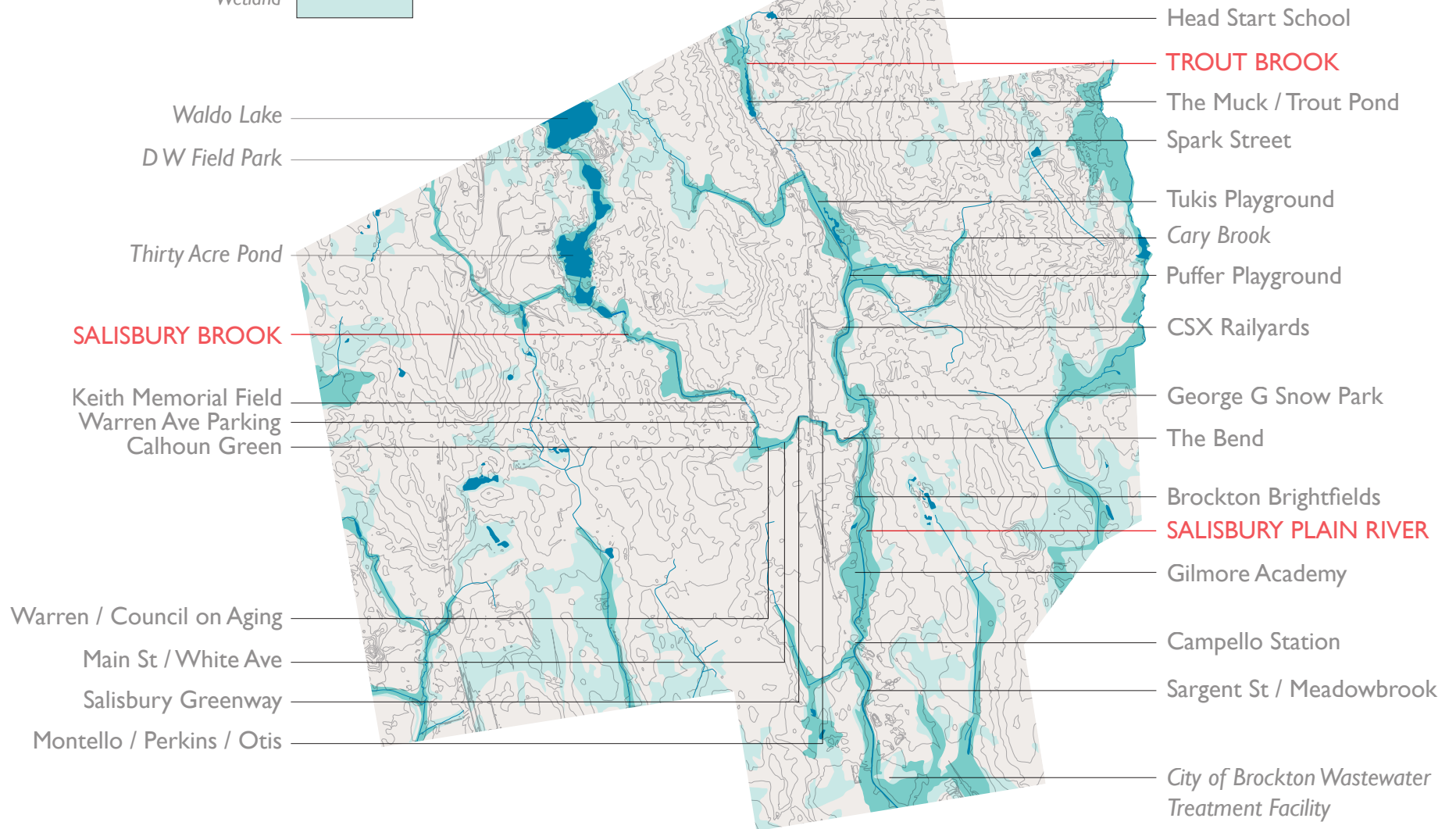
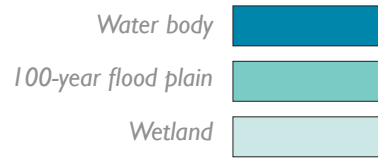
This study of the "Two Rivers" is intended to build on what has already been started in the center of the city by mapping out a program highlighting opportunities for extending recreational open space into the neighborhoods and at the same time upgrading an environment that has been abused and neglected over several decades. In addressing both facets of this program (recreation and the environment) it is intended to create an urban context that is attractive, full of recreational choice, healthy and sustainable.

Project Scope and Definition

Scope

This study outlines a program for upgrading the environment abutting the Salisbury and Trout Brooks and explores the potential for introducing new

INTRODUCTION



PROGRAM GOALS / COMMON ISSUES

recreation and cultural opportunities into the city and its neighborhoods. The outcome of the study is the definition of a comprehensive overview for the environment of the Two Rivers and to identify individual action areas that can be prioritized for detailed feasibility, design and implementation. For this more detailed work it will be necessary to incorporate hydrological and soils analysis; civil engineering; environmental and natural resource expertise; and other specialties.

This master plan document has been subject to limited review and input from members of the public and elected officials. It is intended that this document will serve as a stimulus for public discussion in the next phases of the work.

Geography

Trout Brook originates in the lake, pond and marshland area in Holbrook, flowing south into Brockton joining the Salisbury Brook in the center of the city at the junction of Grove and Crescent Streets. The tributaries to Salisbury Brook originate in southeast Stoughton and in the Brockton Reservoir / Waldo Lake catchment located in

Avon, flowing south and east through the center of Brockton, joining with Trout Brook. At this point the two brooks become the Salisbury Plain River which continues south through West Bridgewater, eventually joining the Taunton River. The final outflow is to Assonet Bay flowing into Narragansett Bay.

History

Trout Brook and Salisbury Brook form the roughly Y-shaped armature around which the city has developed over the last two centuries. Neither the Trout Brook nor the Salisbury Brook, even at the confluence (renamed the Salisbury Plain River at this point), was ever big enough to provide motive power or serve as a conduit for waterborne freight (as was the case in the larger New England mill towns). The Two Rivers served rather as a source of water for the industries developed at their edge and, with longer term consequences, as their drain. The railroad, introduced in 1846, laid close to, and parallel with, the north-south river valley, became the conduit linking both passengers and freight to Boston. This rail link to Boston as the port for the

importation of raw materials and the export of finished products overseas became the basis for the preeminence of Brockton as the men's shoe capital of the world by the late nineteenth century.

Program Goals / Common Issues

The city's visioning document, *Plan Brockton 2008*, identifies seven critical areas for the development of the city over the next few years. These are: Employment and Investment; Education; Housing; Infrastructure and Environment; Recreation and Culture; and Identity and Communication. While each of these sectors is interdependent, this study, *The Two Rivers Master Plan*, focuses on environment, culture and recreation as those areas central to realizing the potential of the water courses running through the city. Within the terms of the broader scope of *Plan Brockton 2008*, specific to this study are urban goals; environmental goals and cultural and recreational goals.

Urban Goals

Urban Revitalization

For too long Brockton's waterways have been

URBAN REVITALIZATION

Brockton has adopted legislation in 2007 to encourage mixed use and higher density housing in the city center, close to public transportation. Access to parks and recreational facilities will help to make this urban housing attractive. There are numerous opportunities in the study area for residential development next to the rivers.



NEIGHBORHOOD AMENITY

Parks and open spaces and the pathways in between them can support city dwellers and neighborhoods in all season recreational activity. Access to the water's edge, well signed and lighted, is critical for the success of the projected river trail.



ENVIRONMENT and PUBLIC HEALTH

Cleaning up the river, adjacent land and pedestrian links from the neighborhood creates a healthier, cleaner environment and encourages outdoor activities such as walking, fishing, skiing as well as cultural or historical pursuits.



see for example, the work of the Bronx River Alliance
- www.bronxriver.org

treated as drain and dumping ground. As unsightly as it has become, the river is now abutted by a number of abandoned or unsightly buildings, scrap metal yards, waste depositories and hardtop parking lots. It is clear that so long as the rivers are regarded as poorly regarded and polluted waste channels there is little likelihood of increasing the value of abutting land. As has been shown in other cities (see pages 52-53) significant investment and the enhancement of the urban fabric are critically dependent on the improvement of the river environment.

Investment in inner city brownfields and existing structures is central to the prevailing philosophy of 'smart growth', enshrined in Brockton's 2007 40R zoning legislation encouraging mixed use and higher density housing in the city center close to public transportation. As progressive as this legislation is, actual implementation is critically dependent on improvement of the surrounding urban context, including the rivers.

Neighborhood Amenity

There is great untapped potential in the use of the rivers as an amenity for adjoining neighborhoods. On

the positive side, the more the water itself and the water's edge can be cleaned up, the more attractive it will be to live close to the water for health and recreational purposes as well as the natural beauty that will inevitably attract homeowners and residents. Only occasionally is the waterway adjoined by compatible, well-tended uses – for instance along the backyards of residences on Summer Street, to which there is limited public access; or at the edge of the Tukis and Puffer Playgrounds from which there is restricted and poorly maintained access.

Public Health

The potential in the development of the water's edge as an environmental and recreational asset will also have a positive public health benefit. Numerous studies have shown that opportunities for fresh air, exercise and social interaction in a well-maintained public space contribute to a sense of well-being, reduced sickness, increased life expectancy and a raised level of neighborhood security as these spaces become better used and maintained. Developing recreational program around this natural asset presents a positive antidote to social alienation.

Giddings, Hopwood, Melling and O'Brien: *Back to the City – a Route to Urban Sustainability* in Mike Jenks and Nicola Dempsey, *Future Forms and Design for Sustainable Cities*, Oxford, 2005

Environmental Goals

Increased environmental awareness has led to a generally accepted recognition of the urgency of not only reducing the environmental degradation typical of urban industrialism but reversing that trend even as reinvestment in the city is encouraged. Stabilizing and restoring river hydrology and restoring land to its natural state are critical to a successful outcome. Environmental restoration, preservation and mitigation measures that are equal and compatible with the maintenance of a balanced and healthy environment are now seen not only as subjectively desirable by residential developers but an objective imperative and a matter of urgency for public policy.

Cultural and Recreational Goals

Developing a cultural and recreational program for the Two Rivers will play a vital role in fulfilling the urban and environmental goals outlined above. Water based recreation as well as programming for the water's edge will attract residents and workers which in turn will lead to city and neighborhood revitalization with the provision of amenities and the improvement of public health.

RIVER POLLUTION

Pollution manifests itself in two ways: long term water and soil pollution from industrial waste and nitrogen fertilisers causing poisoning of fish and plants; and garbage pollution which although sometimes toxic, is often more of a visual eyesore.



HYDROLOGY

Factors contributing to flooding are: overbuilding in the floodplain and depletion of wetlands; bridging, tunneling and channelization of the watercourse, constricting flow; and extensive impermeable surfaces that cause faster runoff and flash floods.



For a discussion on the complexities and limitations of this type of river restoration however, see Cornelia Dean: *Follow the Silt* New York Times Science Section, June 24, 2008.

STRATEGIES FOR ACTION

Strategies

This section proposes strategies for achieving the goals proposed in the previous section. These are divided into Physical Strategies, concentrating more on the design, modification and restoration of the physical environment; Programming Strategies that are more activity based; and Implementation Strategies that focus on the methods by which these proposals are put into action. These three categories are to a greater or lesser extent interrelated so each has to be considered as a potential adjunct to the others. For example, the cleaning of the river banks can be organized on a community basis and developed into an educational opportunity or a seasonal event for the neighborhood or city wide.

Physical Strategies

In pursuit of the goals set out above, there are strategies for implementation that apply generically throughout the study area. While these may be modified and adapted to specific local conditions, it is useful to set them out in their generic form to demonstrate which strategies have systemwide application and which are more site specific.

This overview will also indicate the range of design specialties required in the next stages of implementation.

Hydrology

Much of Brockton lies in the 100-year, and even the 500-year floodplains of the Salisbury and Trout Brook Rivers. To take two examples, there has been perennial flooding in the area north of the Tukis Playground (Fletcher Street and Trout Street) as well as in downtown areas in the vicinity of Bartlett and Warren Streets. Flooding may be attributed to four critical characteristics of urban development over the past decades:

- a continuing history of building in the floodplains;
- the proliferation of impermeable surfaces (causing greatly accelerated rates of runoff);
- the channelization of the watercourse and the building of physical obstructions restricting flow;
- and the depletion of natural wetlands thereby diminishing the natural capacity of the surrounding riverine land to absorb additional volumes of water during periods of high rainfall.

Strategies for the mitigation of these conditions must therefore include:

- Increasing the absolute and relative amounts of permeable surface adjacent to the rivers;
- Removing obstructions and returning the rivers to their natural course wherever possible;
- Increasing the hydrological capacity of surrounding wetlands either by expanding the remaining areas of wetland or by creating new wetland terrain.

Soil and Water Remediation

According to current EPA maps of the Trout and Salisbury Brooks, there are numerous hazardous waste spots, some toxic releases and an 'impaired water' designation that applies to ponds fed by, and draining into, the rivers. The extent of the compromise cannot be quantified by this study but it is strongly indicated that in the interests of adjacent uses (such as residential areas, schools and playgrounds) and a recreational program for the river, that a full body of water and soils testing be undertaken.



Phytoremediation is the direct use of living plants for in situ remediation of contaminated soil, sludges, sediments and ground water through contaminant removal, degradation or containment. Growing, and in some cases harvesting, plants on a contaminated site as a remediation method is an aesthetically pleasing, solar-energy driven, passive technique that can be used to clean up sites with shallow, low to moderate levels of contamination. This technique can be used along with, or in some cases, in place of mechanical cleanup methods. Phytoremediation can be used to clean up metals, pesticides, solvents, explosives, crude oil, polycyclic aromatic hydrocarbons, and landfill leachates.

US Environmental Protection Agency: Phytoremediation Resource Guide, Washington DC, June 1999

Phytoextraction is one particular remediation process whereby plants remove contaminants from the soil through natural processes, for example:

Arsenic, using the Sunflower (*Helianthus annuus*), or the Chinese Brake fern (“*Pteris spp*”), a hyperaccumulator. Chinese Brake fern stores arsenic in its leaves.

Cadmium and zinc, using alpine pennycress (*Thlaspi caerulescens*), a hyperaccumulator of these metals at levels that would be toxic to many plants. The presence of copper seems to impair its growth.

Lead, using Indian Mustard (*Brassica juncea*), Ragweed (*Ambrosia artemisiifolia*), Hemp Dogbane (*Apocynum cannabinum*), or Poplar trees, which sequester lead in its biomass.

Salt-tolerant (moderately halophytic) barley and/or sugar beets are commonly used for the extraction of Sodium chloride (common salt) to reclaim fields that were previously flooded by sea water.

Uranium absorption, using sunflowers, was used after the Chernobyl accident.

Mercury, selenium and organic pollutants such as polychlorinated biphenyls (PCBs) have been removed from soils by transgenic plants containing genes for bacterial enzymes.

images, left to right

Wetlands adjacent to Gilmore Academy

Sewage works at Burlington Vermont working on principles of phytoremediation

A plantation growing willows for biomass

Wetlands at Tukis Playground

Soil erosion on the river bank is increasingly recognized as being a complex restoration issue with uncertain outcomes. See Cornelia Dean: *Follow the Silt*, New York Times Science Section, June 24, 2008.

Absent such analysis a program for remediation cannot be determined at this stage. It is worth noting however that for cases of mild to moderate toxicity a technique increasingly used for natural restoration is phytoremediation and its adjunct, phytoextraction – both of which would be fully compatible with the program for creating a recreational and natural resource in the city.

This approach to remediation is natural, clean, efficient, inexpensive and non-environmentally disruptive, as opposed to more disruptive processes that require excavation of soil.

Landscape Interventions

Landscape improvements may enhance and restore wildlife habitats, increase local biodiversity, control erosion around the river banks, and increase public awareness of environmental issues. Additionally, many landscape interventions may reduce the risk of flooding along the river banks and contribute to hydrological improvements (see preceding section).

- **Erosion Control:** riverbank erosion is a positive feedback cycle that needs active intervention



to stop and reverse. As riverbanks erode, existing plants and trees that normally control erosion (by “holding” riverbank soil back with their roots) are damaged. As these plants are damaged, erosion is exacerbated. Erosion control will include soil retention measures, including planting new trees and plants and incorporating erosion control net along the riverbanks. Some locations may require the insertion of slatted boardwalks to prevent erosion by pedestrian traffic.

- **Landscape Naturalization:** Restoration of Indigenous species and control of invasives needs to be identified and prioritized.
- **Landscape Screening:** In cases of unsightly or incompatible uses in close proximity to the water’s edge, landscape screening will mitigate the effects, visual and aural.
- **Productive planting** refers to planting that yields a useful harvest in a form of urban farming in public space. For example, the orange trees lining the streets of Seville, Spain are harvested for their fruit which is sold to marmalade

manufacturers. Willows have traditionally been planted and harvested on river banks as a crop for basket weaving, fencing and in recent times, as bio-mass fuel for distributed combined heat and power plants in neighborhoods. Tree nurseries for street plantings can be established on some sites and can also be linked in with a school program so that students have a vested interest in the health of ‘my tree’ even after it gets planted in the city streets.

- **Wildlife habitat:** just as people need specifically designed thoroughfares to promote movement along the river, animals also need safe and accessible thoroughways to travel between one open space and the next. Opening up passages to wildlife increases the size of a wildlife habitat by making new areas of open space available.

Supporting Infrastructure

In addition to recreational and environmental improvements, supporting infrastructure improvements are a necessary part of forming connections between different open spaces along the river and providing basic services to the river’s

WALKWAYS and FOOTBRIDGES

The rivers' edges need to be accessible and at the same time protected from foot traffic. A system of footbridges and boardwalks constructed of non-toxic biodegradable

materials can be constructed at critical points along the watercourse and in the wetlands to allow visitors to engage with the natural world in the middle of the city.



LIGHTING and SIGNAGE

Sidewalks leading to the river can incorporate signage for pedestrians. Exterior lighting can be powered by photovoltaic panels.



visitors. The continuity of the infrastructure provides an opportunity to visually unify the open space network through consistent and strong design which will in itself act as an identifier of public open space.

- **Footbridges** are an important element in promoting views and a sense of continuity of open spaces along the riverfront. Because open space facilities exist on both banks of the river, it is important to create easy and inviting pedestrian crossings over the river impinging minimally on the natural habitat.
- **Walkways** constructed along the river's edge should be constructed so as to impinge as little as possible on the shoreline. Screw pile foundations that cause minimum disturbance and can be removed without damage to the environment are a recommended form of sub-structure for these facilities.
- **Sidewalk improvements:** when direct continuity between open space facilities is not possible along the riverfront, pedestrian links may be routed away from the river along existing streets and sidewalks. It is important to make these

routes feel as though they are part of the river's open space system and to that end, sidewalks may be widened, re-paved in a distinct way, and plantings and signage may be incorporated.

- **Lighting:** an effective and sufficient lighting scheme in public parks increases safety, allows for use beyond daylight hours where permitted, and provides an opportunity for lighting fixtures to act as sculptural, designed elements that visually unify open spaces. In such a dispersed set of locations the use of low energy, super bright Light Emitting Diode fixtures powered by stand alone photovoltaic panels (PV/LED) is recommended.
- **Signage** serves to orient and educate park visitors. The design of signage is also important in creating a feeling of continuity among open spaces. Illuminated signage, where required, should also be powered by PV/LED systems.
- **Kiosks** may be located throughout the open space network as needed to provide amenities to visitors. Information kiosks may be located in each area to distribute literature on Brockton,

its river and environment, and history. More elaborate kiosks may be located in heavily-used areas, providing amenities such as food and water to visitors.

- **Public Restrooms** should be located in well populated areas so as to discourage abuse. Clivus multrum composting toilets can be installed without any need for water or drainage infrastructure. Lighting and ventilation can be provided with a PV/LED installation.
- **Sustainable Systems** – in addition to the features mentioned above, all facilities and interventions should be sited and designed so as to avoid 'heat islands', incorporate material reuse and energy reduction measures, and employ life cycle costing to include operations and maintenance as well as capital costs.

Programming Strategies

This section outlines those strategies that are primarily activity-based although there is in many cases a presumption of physical facilities to support the activity.

PROGRAMMING for outdoor activities along the water's edge should be for all seasons, all ages and all dispositions. Walking the dog, cooling off under an irrigation spray, growing fruit and vegetables and selling them are activities that are more or less informal and do

not require significant management or operating costs. Organized sports, at any time of year will need the organizational support of adjacent schools and neighborhoods. Ice skating in particular will need the active supervision of the safety services.

An environmental center such as the one shown here adjacent to wetlands in eastern England, can be jointly sponsored and managed by the schools and by private funding.



For an example of recreational programming for preventive healthcare see the Design Council of the United Kingdom website <http://www.designcouncil.org.uk/en/Case-Studies/All-Case-Studies/Activmobs/>

Passive Recreation

The categorization of passive and active recreational activities is by no means clearly defined but is suggested here for programming purposes since the distinction may be determined as much by the user as by the facility. For example, children may well actively play in areas designed for sitting and reading, and park visitors may read and watch wildlife on the edges of active recreational facilities such as sports fields or tennis courts. Many of the activities in both categories can be directly linked to preventive health care programs that have been shown to reduce the incidence of high blood pressure, diabetes, obesity and other prevalent conditions in vulnerable populations.

Passive recreational facilities support activities such as wildlife observation, passive activities (reading, meditating, sitting, strolling), and educational uses. Passive recreational facilities often have minimal impacts on surrounding natural environments and may be smaller in scale than active recreational facilities. Categories of passive activities for Brockton's Two Rivers may include:

See <http://www.groundworklawrence.org/> which features numerous greening and community action projects, including community gardens, throughout Lawrence, MA

- **Sitting and Looking** - the core of passive recreational programming. Tables and benches, steps and low walls, lean-tos and gazebos, open fields and shady lawns are all inviting opportunities for sitting and looking – either at nature or in the more urban manifestation of ‘people-watching’. Although any open space may become a space for sitting and looking, creating comfortable and inviting spaces for this passive activity may present specific design opportunities not to be overlooked.
- **Wildlife Observation** - animal hides and bird lookouts are in effect specialized forms of “sitting and looking” facilities that often take the form of unobtrusive structures inside which visitors may find shelter and observe wildlife. These structures may also be considered an educational resource linked to local schools’ programs.
- **Community Gardens** are an excellent tool for achieving landscape improvements, benefiting both the riverfront environment and interested residents. This may be particularly attractive

Alemany Farm, San Francisco, CA empowers city residents to grow their own food, and through that process encourages more people to become engaged with their community. Alemany Farm is a project of the Alemany Resident Management Corporation, a non-profit organization dedicated to improving conditions in the Alemany Community, a 165-unit public housing development beset by high unemployment and recurring violence. The Farm is 4.5 acres serving more than 500 residents and includes flowers, vegetables, 80 fruit trees, container gardens and herbs. Produce from the farm is shared collectively amongst residents and program participants.

for ethnically diverse communities who enjoy growing specialty food not usually available in supermarkets. There are also models in San Francisco and London that tie in community gardening with local schools and restaurants. Community gardens can even supplement the produce in a farmers’ market.

Active Recreation

Active recreational facilities include most organized sport and athletic uses, such as playing fields, playgrounds, and facilities for runners and bikers. Active recreational facilities tend to require relatively more space, and are therefore more challenging to site than passive recreational facilities. Below is a list of possible active recreational uses that might be included in Brockton.

- **Pathways for walking and biking** - although walking, jogging, and biking are activities that can happen on any street or sidewalk, specifically designed paths for these activities are a major draw in open spaces and greatly increase the safety of these activities.

THE WATER'S EDGE

Edges of the river bank can be particularly vulnerable. There is evidence here of 'scouring', the erosion of the river bank partly due to increase flow, itself caused by rapid surface water runoff; and partly by the removal of vegetation from the river banks, leaving the soil vulner-

able to being washed away. An appropriate solution to this condition would be to extend the riparian buffer along the edges so that the banks are bound in by the root systems but also the vegetation can filter surface water effluent before it reaches the water, particularly from

adjacent parking lots. There is also an opportunity here (in the George G Snow Park) for phytoremediation along the edges of the Trout Brook. Where direct access to the water's edge is desirable, the use of boardwalks can serve to protect the river bank from erosion.



- **Children's Play Facilities** are among the most important and heavily used elements in an open space intended for active use. Play equipment, safely contained play areas, and other family-oriented facilities draw children and their families to open space, creating an important community focus.
- **Team Sport Facilities** are often the largest open space elements and the most difficult to site. However, they are also among the most heavily-used community facilities. It is important to maintain and improve existing team sport facilities in Brockton, as well identify spaces that might be sites for new team sport facilities.
- **Fishing** in the river needs points of access to bodies of water as well as boardwalks and jetties in specific locations to protect the shoreline environment. Most of all, fishing will require major environmental cleanup of the water body itself.
- **Ice Skating** is an activity that brings visitors to parks during the winter, when most other park activities have been abandoned for the season.

Points of access to the river must be identified and maintained and a safety program initiated providing physical security and up-to-date information on weather and ice conditions.

Cultural Programming

Flexible and varied programming needs to be designed into both cultural and recreational activities so as to serve a wide range of communities and people of all ages in all seasons.

- **Arts Programming** may include incorporating sculpture into open spaces, providing spaces for performances, and providing spaces for artists to come and practice their crafts (such as drawing, painting, and photography).
- **Educational programming** may include simple educational signage to interventions at an architectural scale such as education centers. Depending on land availability and public interest, educational programming would draw visitors to the riverfront and increase public awareness of urban and environmental issues relating to the rivers.

- **Cultural programming** in the public spaces along the river can include celebration of the city's history, personalities and communities in the form of trail markers, informational boards, festivals and even daily activities such as morning and evening exercises during the warmer months.

Strategies for Action

Integrating Public and Private Space

The comprehensive nature of the Two Rivers project – and its success in realizing the benefits of the rivers as a system, rather than a set of disconnected sites, engages both public land (over which the city has significant control) and contiguous private land (over which it has relatively much less control). For example, at the simplest level, a publicly owned parcel of land may be separated from the next publicly owned parcel along the river's edge by private property that interrupts the continuity of a proposed river walk. Similarly, privately owned parcels may obstruct access to the river's edge thus impeding access from a contiguous neighborhood. The essence of a public recreational trail is that it be

FLOOD TOLERANCE OF SELECTED SPECIES

Considerable research has been done on the tolerance of various indigenous species for prolonged submersion in floodwater. One of the reasons for seeing so much unsightly deadwood in and around wetlands is that flooding has increasingly encroached on what was previously supportive terrain. If, as proposed in the text,

additional hydrological capacity is created by extending wetland areas in some places, attention must be paid to appropriate planting.

Examples of species and their tolerance for prolonged submersion are:

less than 5 days: white, yellow and paper birch, beech,

MacBroom, James G., *The River Book - the Nature and Management of Streams in Glaciated Terrains*, Connecticut Department of Environmental Protection Natural Resources Center, Hartford, 1998

hemlock, maple, hazel alder, sycamore

less than 30 days: apple, basswood, poison ivy, redstem dogwood, honey locust, black cherry, white oak

less than a growing season: black alder, red maple, lilac

Less than one year: black oak, red oak, flowering dogwood, willow, green ash etc.





physically and programmatically attractive but that it also be continuous and accessible.

Longitudinal and lateral links – physical pathways as well as view corridors - that create the continuity along the trail and accessibility from the adjacent communities, need to be planned for and negotiated as part of a comprehensive vision and a continuing long term driver of planning regulation in the city. Some parcels may be bought, some acquired by eminent domain and some integrated with easements or setbacks negotiated as the situation allows. As important as the design and programming of each individual site may be, it is equally important to be guided by a comprehensive vision of the recreational trail as a whole.

Public Process and Community Action

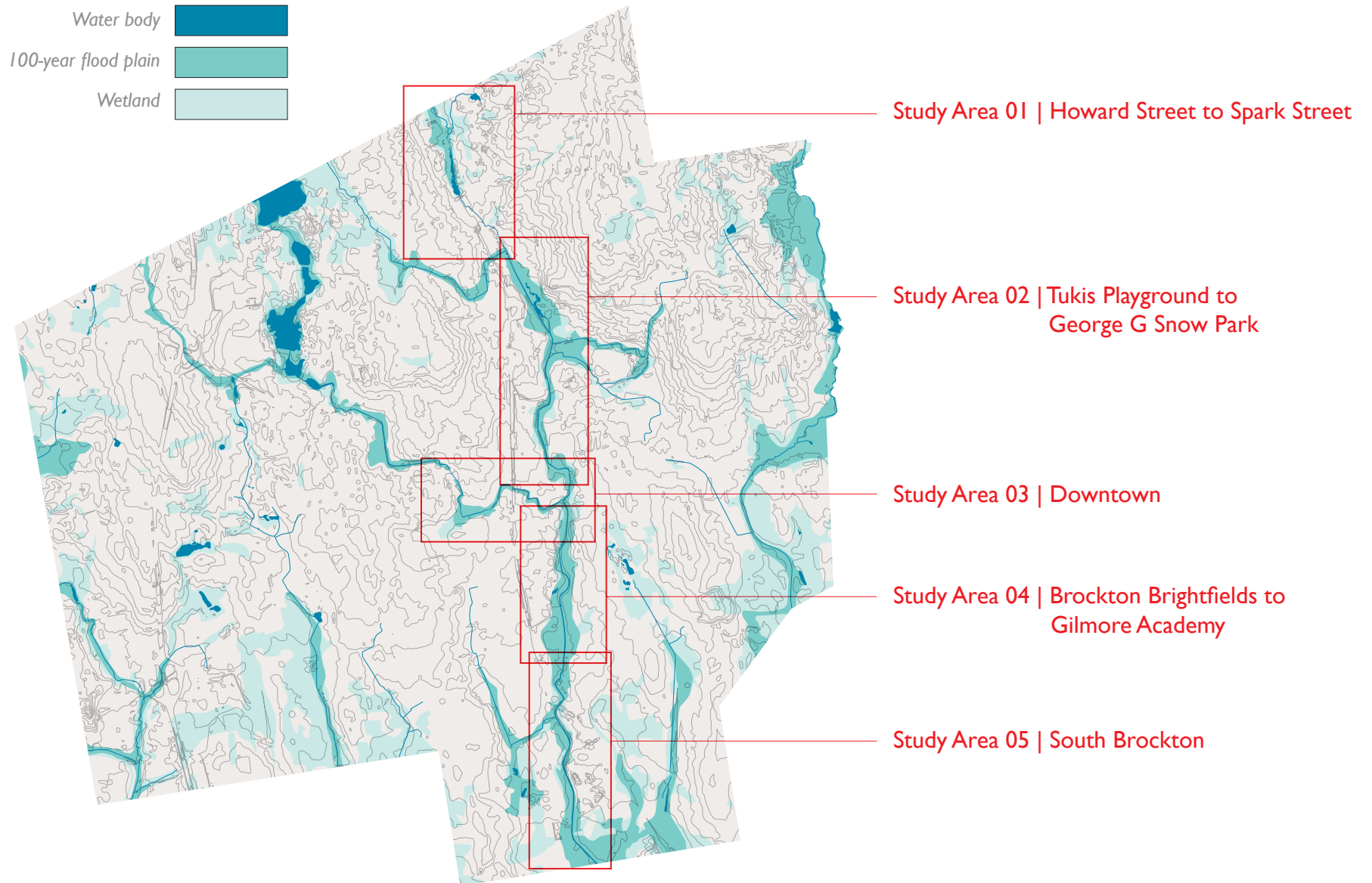
Major projects in the revitalization of the Two Rivers are going to be undertaken in a conventional way by design teams and construction companies contracted to a public agency. The very nature of the project however, one that stretches from the city center out to the neighborhoods and the suburban boundaries of the city, presents both an opportunity and an

obligation to engage the communities touched by the Two Rivers. By engaging the community in planning, design and construction there is an opportunity to achieve a more meaningful 'buy-in' to the resources and amenities provided by the Two Rivers facilities and programs.

Such public engagement can be achieved city wide in the planning stages as the overall concept is developed. However, the closer the project comes to design and construction, participation is likely to be more enthusiastic and effective on a neighborhood basis. Opportunities for neighborhood participation will be highlighted in each of the site proposals.

Next Steps and Funding

This report gives an overview of the environmental and recreational benefits in restoring Brockton's rivers. For the work to proceed further it will be necessary to undertake technical studies either by area or by theme (e.g. hydrological capacity; wetlands restoration; wildlife preservation etc). An indication of funding sources is given at the end the report.



Area Analyses and Proposals

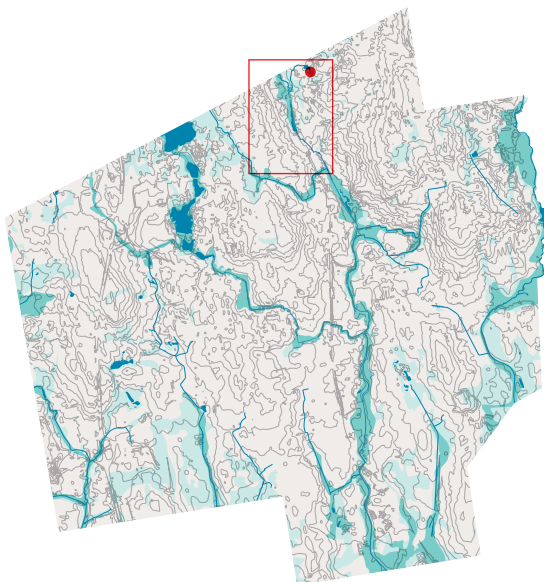
The entire extent of the two rivers in Brockton is divided into five study areas, each one of which has two or more specific sites singled out for analysis and intervention. While each one of the sites requires particular, detailed attention it is important too, not to lose sight of the comprehensive picture of the river system as a whole. The Goals and Strategies sections preceding this part of the report have taken that wider frame of reference but it is critical in this section not to isolate the individual sites as fragmented isolated phenomena. As part of a river system and as a continuous vein through the city it is important to aggregate the individual, neighborhood sites to reveal and maintain for the city a whole that is greater than the sum of its parts.

Study Boundaries

- North - Trout Brook starts approximately at the Avon / Holbrook / Brockton lines from the Head Start School on Howard Street flowing south more or less parallel and to the east of Montello Street to the junction of Grove and Crescent Streets where it joins Salisbury Brook.
- West – Salisbury Brook starting at Eldon Keith Memorial Field running south and east to the confluence of Trout Brook at the junction of Grove and Crescent Streets.
- South – Salisbury Plain River running south from Grove Street to the Brockton / West Bridgewater line, to the east of Main Street.

Study Areas

- Study Area 1 Trout Brook | Howard Street to Spark Street
- Study Area 2 Trout Brook | Tukis Playgrounds to George G Snow Park
- Study Area 3 Salisbury Brook | Downtown
- Study Area 4 Salisbury Plain River | Brightfields to Gilmore Academy
- Study Area 5 Salisbury Plain River | South Brockton



The detention basin adjacent to the school car park and the neighboring sand quarry does not have a sufficient buffer zone to adequately filter noxious effluent. Additional planting and a curb at the edge of the parking area will alleviate some of ill effects of these adjacencies.

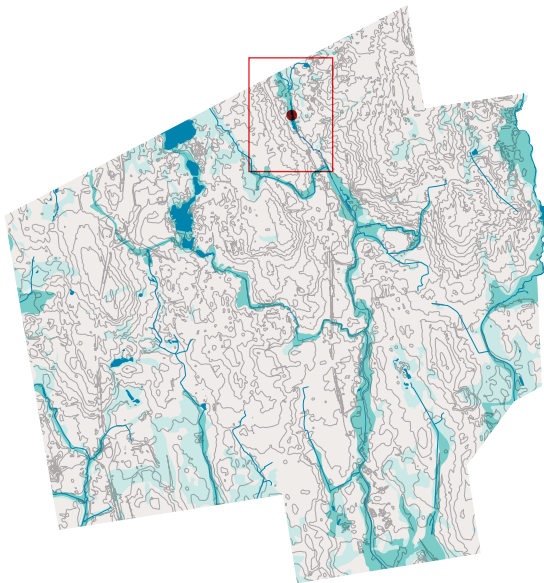


Access into the woods and wetland from the school and the parking lot needs to be investigated more thoroughly to establish a boardwalk. This stretch of Trout Brook can become a teaching space to learn about the environment, for children at the school as well as for visitors.



Ownership	Private
Description	The Head Start School backs onto Trout Brook on the south side of the brook at the northernmost edge of the study area. The back of the school is dedicated mainly to vehicular circulation and parking so there is an extensive hardtop impermeable surface. Retention ponds have been located immediately adjacent to the hardtop around which there are tall grasses and bulrushes. To the south of the school there is an active sand quarry with heavy vehicular traffic moving in between the back of the property and Howard Street. Between Howard Street and the edge of Trout Brook downstream to The Muck (see next section) there are residential and industrial uses lined with deciduous trees and with the commuter rail line.
Challenges	<p>Access to Trout Brook from the north side is difficult: there is no road nearby and the approach on foot is compromised by extensive wetlands in Holbrooke.</p> <p>Access to Trout Brook from the south - from the school or the quarry is compromised by vehicular circulation, access over private property and an overgrown riverbank.</p>

Opportunities	<p>There is an opportunity to start a recreational trail at the northern end of the system. Weekend or evening parking at the Head Start School would allow people to drive and begin the trail from this point.</p> <p>There is also an educational opportunity in making a link between Trout Brook, the retention ponds and the school. Some work would have to be done to clear a path to the river bank, install safety fencing and provide some lighting with interpretive signage explaining the history and ecology of the Trout Brook.</p>
Links	<p>East: from Head Start School</p> <p>South: creating a link south to The Muck would require crossing the rail line and brook at the north end; or crossing the rail line at the south end at The Muck.</p>



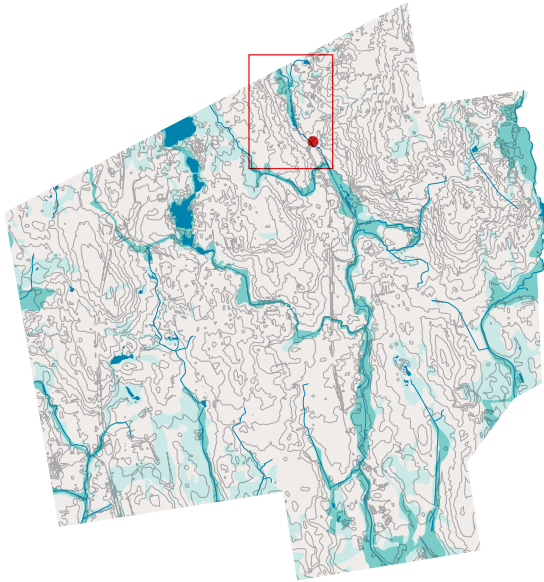
- Create access link to north and Head Start
- Locate appropriate crossing of railroad
- Create continuous boardwalk on west side of pond
- Railroad line impedes easy access from east
- Incompatible use / surface water drainage problem
- Poor water quality / trash filled shoreline
- Potential location for wildlife observation
- Create ramped access from North Montello Street
- Continue trail south to Spark Street - needs signage

The Muck looking north from Howard Street bridge



Ownership	Public / City of Brockton
Description	Originally named Trout Pond, the large pool of water framed in the crotch of North Montello Street and Howard Street is now universally referred to as The Muck. The pond itself has a rich array of plant and animal life and has potential as an environmental, recreational and educational asset.
Challenges	The main difficulties with the site are: limited access; incompatible adjacent uses; and poor water quality. This water body is accessible from North Montello Street down a steep bank which, if the pond is to be made publicly accessible, would need to be carefully graded and ramped. Access from Howard Street is impeded by private properties and the commuter rail lines. Some adjacent uses impede easy access – such as the rail line already noted. Other adjacent uses, such as the warehouse on North Montello Street and associated parking and the trucking facility on Howard Street, are incompatible with environmental restoration and recreational programming for the pond. The Muck itself appears to be generally neglected, the repository of small- and medium-scale trash.

Opportunities	<p>There is an opportunity here for installing a bird / animal hide for observation of wildlife on the west side of the pond. Ramped access to the hide would have to be created coming from North Montello Street.</p> <p>A signage system signifying public access to the site and the recreational trail. Information boards on the history and wildlife in the area would be an educational asset.</p> <p>A substantial riparian buffer (see page 14) needs to be installed for the entire length of this section, on both sides, in order to minimize run off of pollutants from adjacent car parks and industrial and warehousing activities.</p>
Links	<p>West: to North Montello Street</p> <p>North-South: north to the Head Start School, probably on the west side of the pond. South to Spark Street over the road bridge.</p>



Link north to The Muck across Howard Street bridge

Surface connection links in to Montello Station - needs lighting and signage. Trout Brook in tunnel below grade.

Mixed use / residential development on Spark Street and Intervale Street

Public open space where Trout Brook comes to the surface. Community Gardens as interim use.

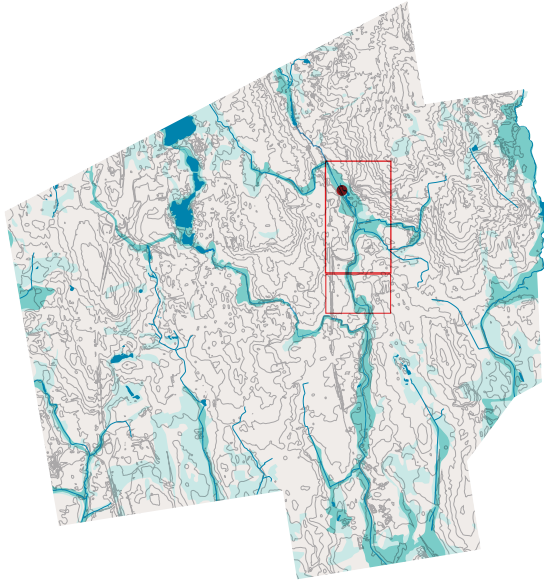
Link south across Ames Street to Tukis Playground

Spark / Intervale block, looking north from Ames Street.



Ownership	Private
Description	At the north end of Spark Street is Montello Station which attracts a significant number of commuters during the weekdays, some arriving on foot but most coming by car taking advantage of the station car park. The southern half of Spark Street is derelict or undeveloped and would probably benefit most from transport oriented development (TOD) of mixed use housing / commercial / retail space.
Challenges	The main challenge of this stretch of Trout Brook is that for a considerable distance the brook itself is underground, concealed from view. Also, the neglect and dereliction of the undeveloped sites is not conducive to pedestrian recreation.

Opportunities	The major opportunity for Spark Street will be triggered by private investment on the sites lining the street itself. There are opportunities in the zoning and permitting process to include signage, lighting, public benches, information boards to create a visible and attractive public space in this part of the recreational trail. Trout Brook does surface in the Spark Street / Intervale Street block providing an opportunity for developers to make this feature an environmental and community asset. Information boards and maps in the Montello station and good public lighting might encourage members of the public to walk to the train instead of taking a car. Community gardens might be considered a suitable interim use. East-West – strong link to the train station and to neighborhoods. North-South: north to The Muck over the Howard Street bridge. South to Tukis Playground over Ames Street.
Links	

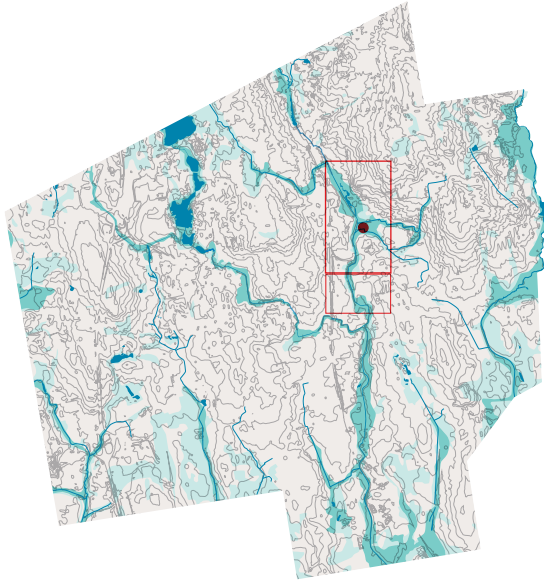


Tukis Field viewed from Melrose Street. Vegetation in middle ground obscures views of Trout Brook



Ownership	Public / City of Brockton
Description	The Tukis Playground consists of a baseball field, tennis courts, a children's playground and an extensive green swath for passive recreation, sitting and walking. There are public parking spaces on Melrose Street and there is road access to the edge of Trout Brook and its surrounding wetlands from a dead end spur from Melrose Avenue. The playground forms a continuous eastern edge to Trout Brook and the wetlands flanked on the western side by Mulberry Street and the railroad tracks. The contiguous area of wetland stretches from Ames Street at the northern end to Ashland Street on the southern end of the site. The enclosed main sewer runs through the site from north to south.
Challenges	While the Tukis Playground is a tremendous public asset, there are poor and ill-developed links to the water's edge. The western edge of the wetland bowl is flanked by incompatible uses such as the waste transfer facility, distribution center and warehouse on Mulberry Street. On the corner of Mulberry and East Battles Street there are some derelict buildings alongside the railroad tracks, also fronting onto the wetlands. The warehouse facility at Ames Street also backs onto the wetland making access difficult from the road. It is noted that there has been a history of frequent flooding on Fletcher and Trout Streets causing considerable disruption to the residents and loss of property value.

Opportunities	<p>The adjacency of the Tukis Playground facilities that already exist and the wetland surrounding Trout Brook have the potential to be developed as a valuable environmental, recreational and educational asset for the city.</p> <p>On the west side of Trout Brook there is an opportunity to locate an athletics sports bubble accessible by vehicle from East Battles and Mulberry Streets. A walkway across the wetlands and the brook linking the sports bubble with the open air sports facilities in the Tukis playground would enhance the complementary relationship of the two programs.</p> <p>On the east side of the brook there is an opportunity to open up and formalize access to the water's edge at Melrose Avenue to support activities such as fishing and boating as well as recreational walking. Board walks supported on augur piles will ensure minimal damage to the wetland.</p> <p>Additional hydraulic capacity could be created on the edges of the wetland area in the western half of the site where there are empty sites. The culvert under East Ashland Street may also need widening. Each of these measures would serve to mitigate flash flooding around Fletcher and Trout Street.</p>
Links	<p>North – create an at-grade pedestrian crossing with signage on Ames Street</p> <p>South - create an at-grade pedestrian crossing with signage on East Ashland</p> <p>West – access from East Battles Street / Mulberry Street</p> <p>East – access from Tukis Playground and Melrose Avenue</p>



Western edge of Puffer playground, saturated and unusable



- Malfardar Brook
- Incompatible uses
- Puffer Playground

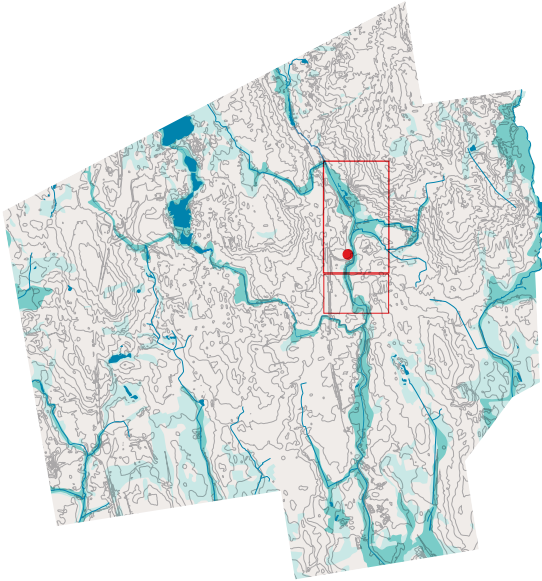


- Boardwalk along edge of marsh
- Expanded hydrology for flood control
- Community gardens, children's play
- New path and boardwalk
- Cary Brook

Ownership	Public / City of Brockton
Description	Puffer Playground is bounded the River Street and Brides Place residences on the west and by truck loading facilities and automobile junk yards to the northeast; Puffer Playground in the central section; and the Teele Street / Carter Street / River Street neighborhood to the southeast. Puffer Playground contains a baseball diamond, a basketball court and children's swings set in mown greenspace. The park is easily accessible from the surrounding neighborhoods but even though it is contiguous with Trout Brook there is no easy access to the water's edge.
Challenges	The major challenges for this stretch of Trout Brook are: flooding, incompatible uses and access. About 25% of Puffer Playground itself is compromised by flooding and it remains soft and soggy around the children's play area even when there has been negligible recent rainfall. The automobile junkyard is not a compatible use either for the restoration of Trout Brook or for the surrounding neighborhood. It would be prudent to test the water, wetlands and surrounding soils for leachates from this industrial use. A riparian buffer using phytoremediation would be appropriate in this location.

Opportunities	There is a great opportunity to restore as much as 50% of the Puffer Playground to wetlands, adding hydraulic capacity to the brook, mitigating some of the more extreme consequences of flash flooding. In opening up Puffer Playground, the opportunity can also be taken to create a river walk making the north-south link with adjoining parcels. Additional programming might include the creation of a shallow open air ice skating rink in the winter; and community gardens.
Links	West – access from River Street frontage East – access from North Cary Street / Malfardar Brook and from Puffer Playground North – access from East Ashland Street. South – access from Elliott or Carter Streets.

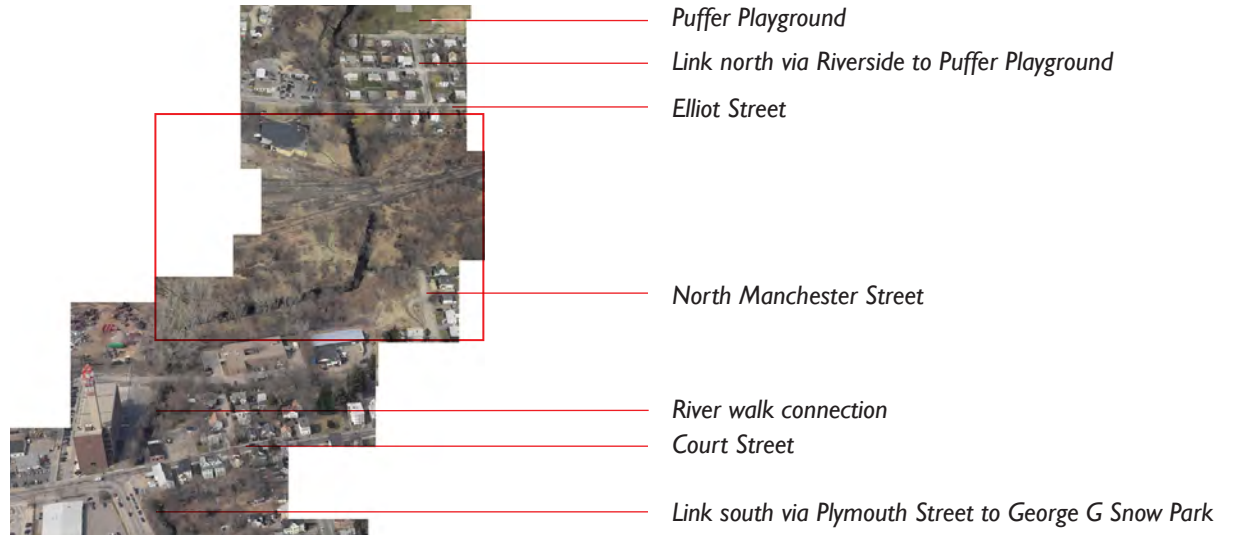




Buffer zone for public access on both sides of Trout Brook.

Property on both sides to be reserved for medium density residential development

Cleaning, dredging, erosion control and possibly widening of old railroad bridges required



Ownership

Private

Description

The CSX railyards have not been used for some years and the ground is lying fallow. The site is largely overgrown with grass, shrubs and untended trees. Trout Brook passes under the tracks through a series of adjacent brick-arched low bridges which are often blocked by broken branches impeding the flow of water. The site is within five minutes walking distance of the Brockton commuter rail station and is therefore eminently suitable for residential or mixed use development.

Challenges

Trout Brook has in the past been treated more or less as a public gutter and is in a poor state. The challenge for any residential development is to transform the brook into the central asset of the development both for the enhancement of residential living but also for public enjoyment. It is not known whether a Chapter 21E investigation has been undertaken.

Opportunities

The opportunity in the private development is to transform the image and use of the river front for maximum benefit and enjoyment of future residents and the public. Development guidelines and zoning overlay would be appropriate instruments to ensure the future amenity of the river for both public and private benefit. Public access on both sides of the brook would be desirable.

Links

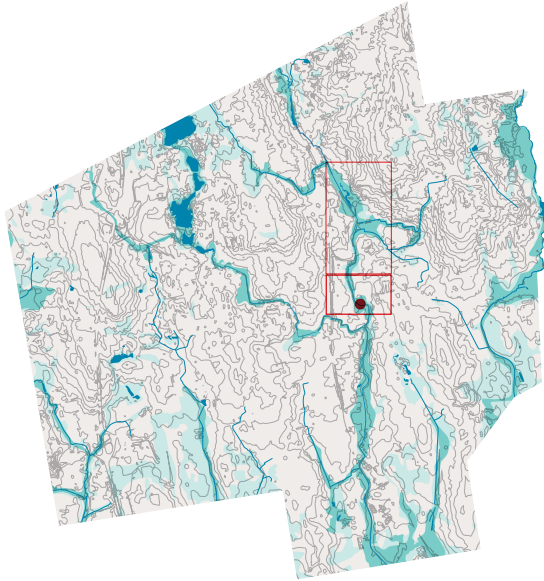
North – from Elliot Street

South – from Court Street or North Manchester Street

West – no direct access, bounded by railroad

East – from Elliott or North Manchester Street





Although the south side of Trout Brook in the George G Snow Park is visibly at a higher elevation than the north side, almost the entire park is a designated wetland and almost all of it is on the 100-year flood plain. Increasing the hydrological capacity of this stretch of Trout Brook is possible by excavating areas on the north side and by dredging the watercourse.



Possible location for environmental education center

Area of perennial flooding

Plymouth Street strip



Create additional hydrological capacity

100-year floodway

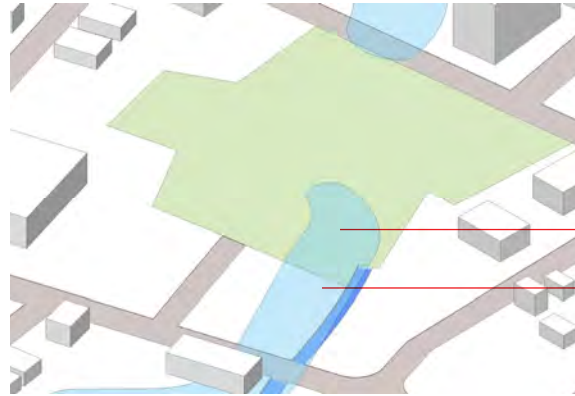
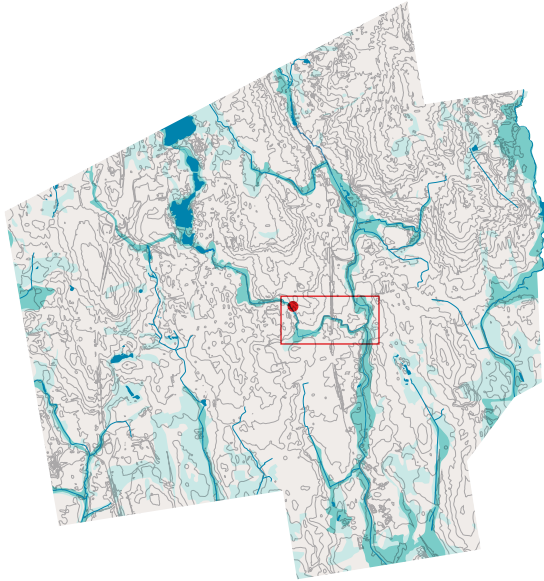
Wetland



Ownership	Public / City of Brockton
Description	The George G Snow Park is the largest public park in the center of Brockton. It is bounded by Centre Street on the north; Crescent Street on the south; Plymouth Street on the west; and the Brockton Union Cemetery to the east. The O'Donnell playground is situated to the north across Crescent Street. The Plouffe Elementary School and a swimming pool are located in the park and there is a retention basin landscaped as an ornamental pond. The park has a number of fine, mature trees. In addition to students and faculty and those having business with the school, there is also some pedestrian traffic using the park for recreational purposes or en route to visiting the cemetery.
Challenges	The biggest challenge facing the park is the perennial flooding of the low lying land to the northeast of Trout Brook at the bend in the stream. This entire area could be restored to wetland with a considerable increase in hydraulic capacity to mitigate the extent and severity of perennial flooding. In addition it may be necessary to measure the capacity of bridge openings in relation to the likely volume of water in the event of a 50- or 100-year flood.

Opportunities	There are opportunities for significantly enhancing the George G Snow park by linking it in to a continuous river trail - for example by opening up and cleaning up the Plymouth Street strip. The adjacency of the Plouffe Elementary School creates an opportunity for creating an environmental education center close by which could be used by the school and the general public, serving the entire length of the river trail. The proposed restoration of the wetlands could also be used as an educational program. An alternate site is proposed adjacent to Gilmore Academy - see 04 02 pages 44-45
Links	Access to the park is good with the exception of the link to the north in the strip of land parallel to Plymouth Street running between Center Street and Court Street. Since that land is publicly owned it would be relatively straightforward to develop it as landscape space between the Plymouth Street sidewalk and the water's edge.





Steep bank and high maintenance, unusable space

100-year flood plain

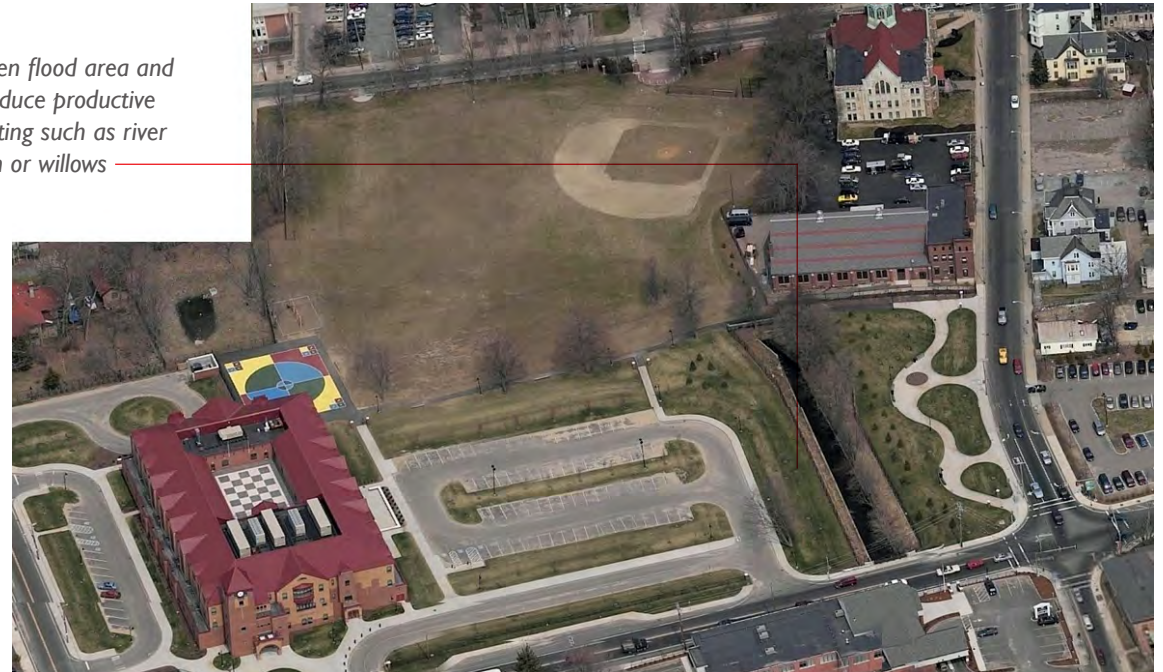
Widen flood area and introduce productive planting



Salisbury Brook is culverted under the Keith Memorial Field for the most part. It emerges into daylight at the south end of the site, flanked on both sides by steep banks of mown grass, more or less unusable and with high maintenance costs. Two things need to happen: firstly, the open channel should be widened to increase the hydrological capacity of the stream; and secondly, the edges of the banks should be planted with productive vegetation, e.g. river birch or willows, both as educational asset and as environmental resource.



Widen flood area and introduce productive planting such as river birch or willows



**Ownership**

Public - City of Brockton

Description

Situated next to the Arnone School, the Eldon B. Keith Memorial Field provides athletic facilities and is used as passive recreational space by the adjoining neighborhood. Salisbury Brook is channeled through an underground culvert for almost the entire length of the park, emerging in open cut at the southeast corner of the site.

Challenges

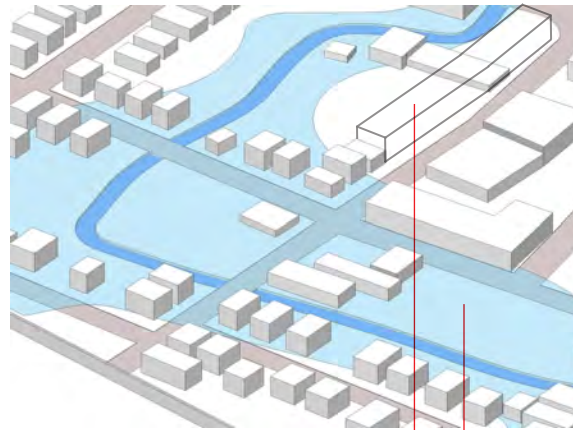
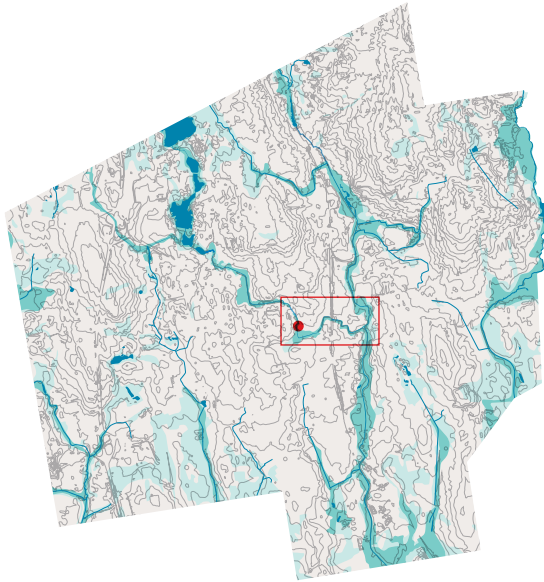
The grading and landscaping of the open channel at the southeast corner of the site has been poorly executed, enabling trash to build up at the bottom of the graded slope against the security chain link fencing. The extensive hardtop of the surface parking area should be drained to a retention pond.

Opportunities

If the edge of the brook were to be regraded, the opportunity exists to widen the watercourse and provide additional hydrological capacity to mitigate the effects of flash flooding. Productive planting and a riparian buffer (to filter runoff from the car park) on the edges of the embankment are essential.

Links

There are excellent links to all parts of the park from surrounding roads and sidewalks.



Potential residential development

100-year flood plain

Public access adjacent to Brook

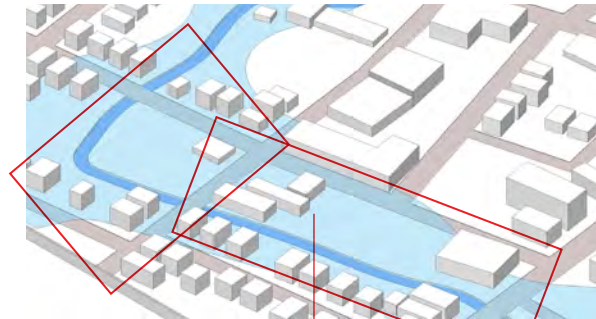
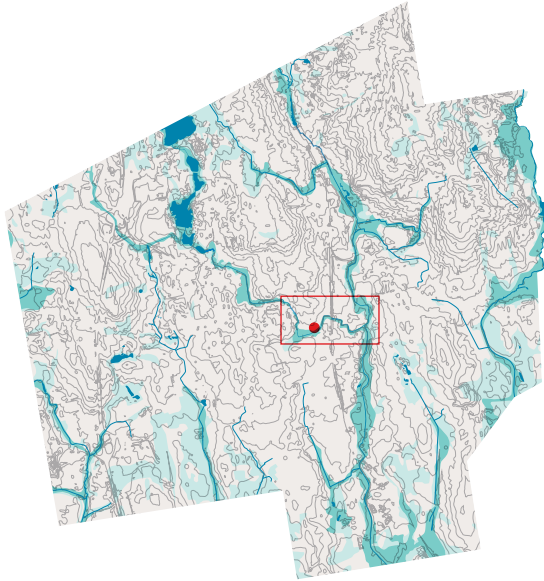


The Warren Street frontage of the block between Belmont and Bartlett Street is a prime site for residential development. The street side of the site is out of the 100-year floodplain. The back of the site can be made into a public walkway at the edge of the Salisbury Brook.



Ownership	Public / Private
Description	This block extending from Belmont Street on the north to Bartlett Street on the south, flanked by Warren Street on the east side and the Salisbury Brook on the west, consists of privately owned parcels with a publicly owned parcel in the center with significant street frontage on Warren Street. At the northern end of the site there is a derelict industrial building and a parking lot for low rise commercial premises at the corner of Belmont and Warren. At the southern end of the site there are a number of privately owned detached houses. The publicly owned lot in the center of the site is used for parking.
Challenges	This part of the Salisbury Brook – continuing through Main Street – is subject to flooding. The 100-year flood zone encompasses all the residences at the south end of the site and extends some feet into the publicly owned parking lot. The channelization of the brook as it passes under Bartlett Street appears to pose undue restriction on the flow of water during times of heavy rainfall.

Opportunities	<p>This combination of sites offers excellent development opportunities for mixed uses close to downtown. The limitation entailed by the flood zone offers an excellent opportunity to open up the western side of the site to Salisbury Brook for public access as well as providing landscaped open space or parking for any future new development.</p> <p>There may also be an opportunity on this stretch of the brook to broaden the stream to create extra hydraulic capacity in case of flooding. The creation of permeable surfaces at grade and the introduction of a riparian buffer would also contribute to the mitigation of flash floods and the filtration of water runoff.</p>
Links	Currently the best access to the brook is on the east side from Warren Street. Currently, privately owned property blocks access from the three other sides.



100-year flood zone

Public park with increased hydrological capacity in watercourse

Difficult link at Warren Street alternative route via Father Kenney Way
Walkway in front of Council on Aging



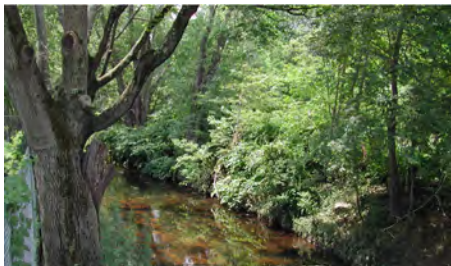
Study Area 03 | 03

Calhoun Green

Study Area 03 | 04

Warren Avenue to The Council on Aging

Ownership	Public / Private
Description	The area bounded by Bartlett Street on the north, Warren Street to the east and the L-shaped bend in the river on west and south sides is known as Calhoun Green. A taxi service is being run out of the single storey property at the corner of Bartlett and Warren Street.
Challenges	This site is particularly prone to flooding and is entirely within the 100-year flood zone.
Opportunities	Since this site is unsuitable for development on account of its being within the flood zone, there is an opportunity for creating an urban park as part of the Salisbury Greenway and at the same time create additional hydraulic capacity as a means of flood prevention.
Links	There are excellent links on all sides.

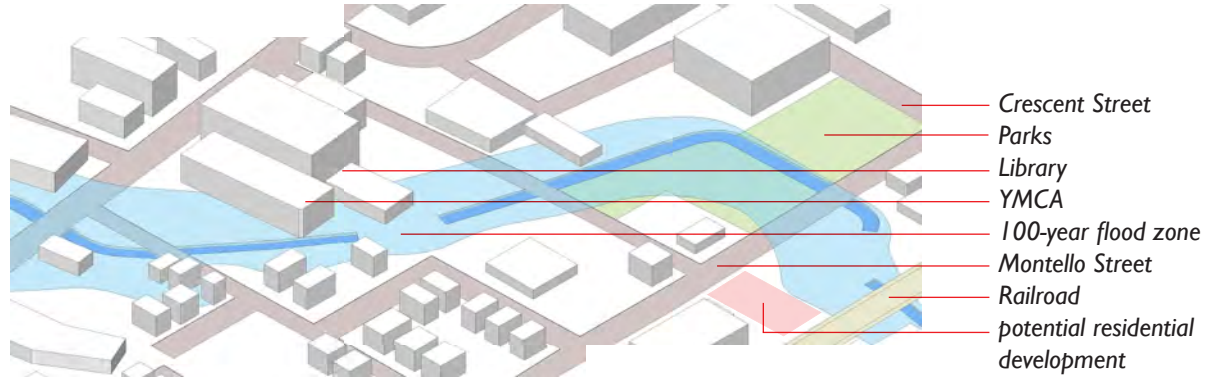
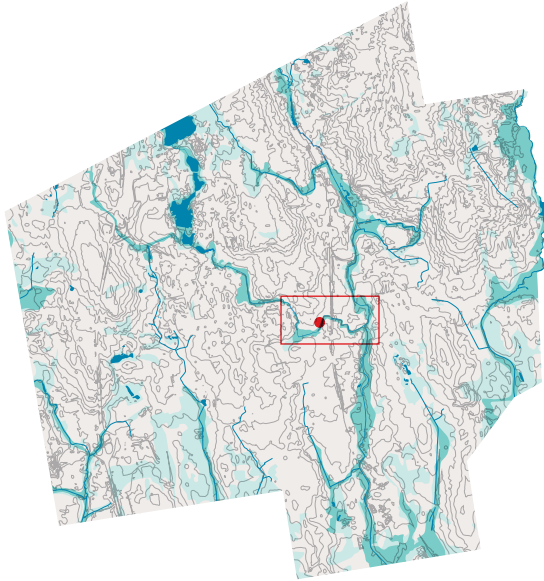


Ownership	Private / Institutional / Public
Description	This section extends from Warren Street to Main Street. On the north side is a mixture of private and institutional properties and the publicly owned Council on Aging on the corner of Father Kenney Way and Main Street. There is an extensive parking lot mid-block serving the church and the Council on Aging. On the south side of the brook the properties are private residential with a light industrial use on Main Street.
Challenges	This area is also within the 100-year flood plain but is also substantially developed and the brook is channelized for the entire stretch between concrete embankments.
Opportunities	The main opportunity here is to create a walkway on the north side of the brook accessible from the Senior Center and to the general public
Links	Warren Street access is through private property; from Father Kenney Way and Main Street is public.

Salisbury Brook runs into Calhoun Green from open banks into channelized stream (under Warren Avenue) contributing to the flooding in this area.

Salisbury Brook runs in a deep channel past the Council on Aging building





The northwest side of Salisbury Brook from Main Street to White Avenue, is flanked by impermeable ground surfaces with rapid run off, contributing to a surge in water volume during heavy rainfall. Investigations should be made to locate retention ponds or cisterns and create a filtration buffer to reduce surface water flow.

The two Salisbury Greenway parks at the corner of Crescent and Montello Streets provide extensive permeable surfaces but the flow of water in storm surges may be impeded by bridges at White Avenue and Montello Street.



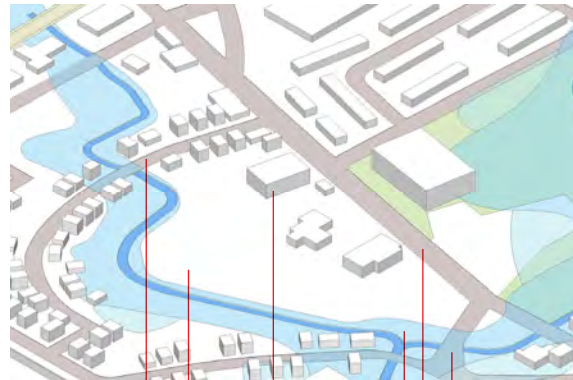
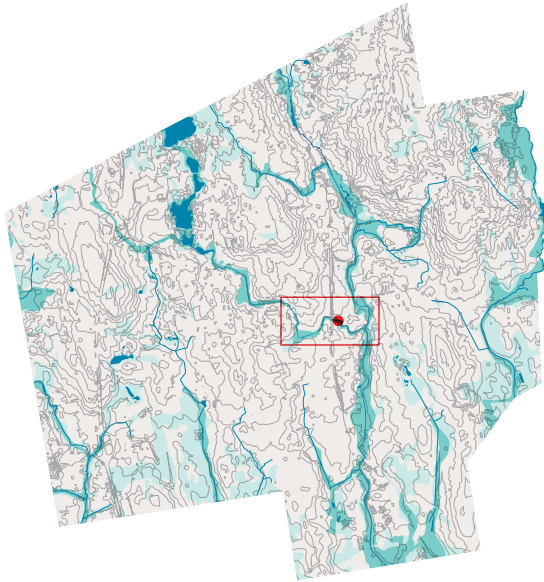
Ownership	Private / Institutional / Public
Description	This area extends from the corner of Main and Allen (where there is a small triangle of publicly owned space on the southeast corner), through the YMCA parking lot and continuing past the backs of the YMCA building and the public library. On the east side of the brook the frontage consists of private residences and the Boys' and Girls' Club property.
Challenges	While the southeast side of the brook is on higher ground, the northwest side is within the 50- and 100-year floodplain. Since this area is mostly for parking and loading there is no serious challenge to property.
Opportunities	The best opportunity in this area is to include a pedestrian walkway on the northwest side of the brook.
Links	Excellent links both from Allen Street and White Avenue.



Parking at the back of the YMCA and Public Library consists mainly of impermeable bituminous concrete.

Ownership	Public
Description	These two parks on Montello Street, one fronting White Avenue and the other Crescent Street have been designed as the beginning of the Salisbury Greenway.
Challenges	The parks are within the 50-and 100-year flood zone.
Opportunities	The greatest opportunity here is to install a pedestrian bridge linking the two parks.
Links	Excellent access from White Avenue, Montello Street and Crescent Street. Access to Maple Avenue could be improved with a designed pedestrian trail to link City Hall plaza with the Greenway.
	<i>Between Montello Street and the railroad Salisbury Brook is culverted underground. There is an opportunity to open it up and make a small park adjoining potential residential development.</i>





Otis Street
The Bend
Adult Education Center
100-year flood zone
Crescent Street
Summer Street

- Expand hydrological capacity at Otis Street and The Bend
- Open up culvert between Perkins and Otis Street
- Widen the channelization at confluence of Salisbury and Trout Brook
- Create filtration buffer between car parking and river's edge - e.g. at Adult Education Center.
- Enhance natural woodlands; create productive planting.
- Create continuous river walk on north side

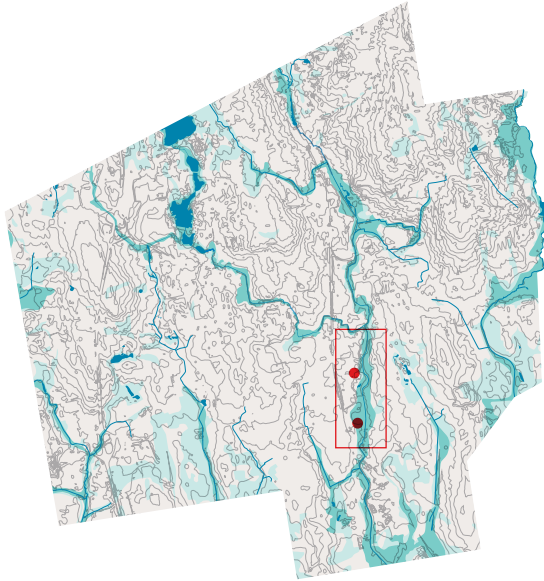


Flood control remediation issues:
unmediated runoff from parking lots; eroded banks;
restrictive channeling; inadequate bridge apertures



Ownership	Private / Public
Description	This stretch of Salisbury Brook extends from Montello Street where it runs in a culvert underneath the railroad - see <i>previous section 03 06</i> - reemerging at Perkins Street and continuing through to Otis Street where again it goes into culvert under the road. With the exception of the Montello Street parcel on the south side of the brook (owned by the City of Brockton) all the other abutting parcels are privately owned, either residential or light industrial uses.
Challenges	Because of the elevated railroad structure and the privately owned abutting parcels, it is difficult to see how a continuous walkway along the water's edge could be created and maintained. The south side of the brook is most prone to flooding.
Opportunities	There is an opportunity on the Montello Street property to develop housing along the street frontage and to provide open space - see <i>previous section 03 06</i> . There is also an opportunity to open up the culvert between Perkins and Otis and expand hydraulic capacity at this point.
Links	Excellent links from Montello Street. Limited access from Perkins and Otis Street. Very limited opportunity for continuous walkway at water's edge.

Ownership	Public / Private
Description	This stretch of Salisbury Brook goes under the Adult Education Center parking lot at Otis Street but is otherwise open with natural banks or channelized. Most of the adjoining property is publicly owned and has attractive natural vegetation and woods.
Challenges	While the south side of the brook tends to be lower lying and in the 100-year flood zone, the north side is at a slightly higher elevation making it less vulnerable.
Opportunities	There is a great opportunity for creating well designed wooded parkland combining a continuous trail along the water's edge. Community gardens on the south side of the stream would serve as an asset for the neighborhood. It is also possible in this area to expand the hydraulic capacity upstream of the channelization where the Salisbury meets Trout Brook. A riparian buffer between parking lots and the stream are essential.
Links	Excellent links to Crescent Street, Otis Street and Grove Street.



Crescent Street
The Bend
Summer Street
Grove Street

Expanded wetland zone to
increase hydrological capacity

Brockton Brightfields - to be
expanded

Expanded wetland zone to
increase hydrological capacity

Environmental Center - this site
could be a suitable alternate to
that proposed adjacent to the
Plouffe School - see pages 32-33

Animal and bird hide located on
edge of wetland

Expanded wetland zone to
increase hydrological capacity

Summer Street

Walkover Commons residences

Perkins Avenue



Ownership
Description

Public / Private
This area extends from the confluence of the Trout and Salisbury Brooks (at which point the two streams become the Salisbury Plain River) heading south from the junction of Grove, Summer and Lyman Streets though to Pine Avenue. On the east side of the site the properties are private residential fronting Summer Street with a number of spur roads linking in to the river and wetlands at the back of the properties. On the west side of the river are residential properties, some light industrial uses and most significantly, the Brockton Brightfields a 425-kilowatt array of 1,395 photovoltaic panels installed on 3 acres of the old Brockton Gas Works site.

Challenges

The tendency for the river to flood is mitigated in this area by the relatively expansive wetlands that can absorb additional flow and volume.

Opportunities

The greatest opportunities here are the expansion of the alternative energy installations and the integration of the neighborhood with the wetlands and the river. A link can be made with these municipal installations and the lessons to be learned at the environmental center proposed for the George G Snow park. Footpaths already exist on the land and should be treated as a guide for establishing sustainable, easily maintained trails with lighting and signage where necessary.

Links

Excellent links on all sides. Some signage may be necessary to indicate the presence of public footpaths.



Ownership
Description

Private
This area extends south from Pine Avenue to Perkins Avenue and is defined largely by the extensive wetlands area bounded on the west side by Gilmore Academy and its associated playing fields.

Challenges

The tendency for the river to flood is mitigated in this area by the relatively expansive wetlands that can absorb additional flow and volume.

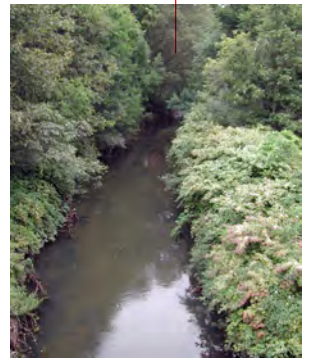
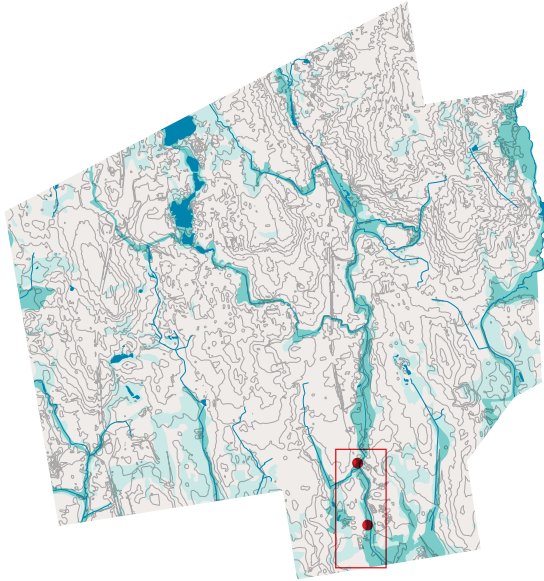
Opportunities

Situated next to a school, there is an opportunity here to develop this section of the Salisbury River as an environmental resource, linked with the environmental center suggested for the George G. Snow park. Animal and bird hides can be installed and made accessible over boardwalks to protect the habitat. At the same time there is potential for expanding the wetlands or installing a series of cisterns to provide additional hydrological capacity.

Links

Excellent links on all sides. Lighting and signage is necessary to indicate the presence of public footpaths.





Ownership	Public / Private
Description	The area to the east of Main Street around Campello Station and Plain Street, continuing upstream to Perkins Avenue is constrained by commercial and light industrial uses.
Challenges	The entire area is inhospitable to pedestrians, compounded by the relative inaccessibility of the river frontage. There is no view of the river from the station platform. Extensive parking areas create acres of impermeable surface encouraging pollution from the runoff and flash flooding.
Opportunities	Opportunities for creating a linking footpath from Campello Station should be explored so as to encourage passengers to travel to and from the station by foot or by bicycle. These opportunities will have to be negotiated with private landowners.
Links	Difficult to access from almost all directions.

Ownership	Private
Description	Meadowbrook and Sargent's Way are roadways designed exclusively for the motorist. While these streets border the Salisbury river it is not obvious from a driver's point of view. For the pedestrian who might appreciate the river the access to the water's edge is out of scale and inhospitable.
Challenges	The main challenge is to increase accessibility to the river for pedestrians. New industrial development along Oak Hill Way and Industrial Boulevard perpetuate a long history of neglect of the river and associated natural environment.
Opportunities	Needs detailed investigation and opportunistic initiative to create lighting, signage and establish sidewalks and footpaths to gain access to the river.
Links	Need improvement throughout.



IMPLEMENTATION

Next Steps

This study presents an overview of Brockton's Two Rivers, with goals for urban revitalization, improving neighborhood amenities, enhancing the quality of the environment and incorporating cultural and recreational programs. The strategies outlined include physical strategies – concentrating on flood control, water quality, wetlands and wildlife preservation; programming strategies – including passive and active recreational opportunities and cultural and educational programs; and thirdly, implementation strategies.

Implementation strategies require further study. The table on page 50 summarizes the strategies by location and by theme to assist decisionmaking. For instance, to take the task by area, it would be desirable to use this report as the basis for conducting citywide workshops in the manner suggested by the Commonwealth River Visions Program. This exercise could be broken down by the five areas employed in the report, each with somewhat different constituencies.

Alternatively, it would be equally valuable to further the study by strategic type or theme. A systemwide study of the hydrology of the two rivers is necessary to inform every decision in every area throughout the city. Issues of flood control, wetlands preservation, water quality and the range of remedial and restorative measures need to be resolved before a fully informed programming process can take place.

Funding will also determine the scope and content of further studies, outlined below. The main type of grant, both federal and state, is focused on environmental quality, transportation alternatives and the expansion of recreational opportunities. A further dimension is added in considering the potential of

NEXT STEPS - QUICK GUIDE

1. *Initiate city and neighborhood public information campaign based on Two Rivers Masterplan giving overview of the issues.*
2. *Prioritize study issues by area and theme. Consult state and federal funding sources to determine scope definition and consultant expertise.*
3. *Write Request(s) for Proposals.*
4. *Establish city-led Client Teams by neighborhood and area.*
5. *Prioritize action items and associated funding.*

the river as a key element in urban revitalization, creating a strong case for alternative compact development of inner city housing, alternative, energy efficient transportation modes and enhancements to the education and cultural resources in the city.

The next steps must therefore be informed both by the need to engage the public in a citywide and area visioning process; more specifically informed technical advice in critical areas; and by the scope of potential funding.

Potential Funding Sources

FEDERAL FUNDING

SAFETEA-LU Safe Accountable Flexible Efficient Transportation Equity Act

<http://www.fhwa.dot.gov/safetealu/factsheets/envirostewardship.htm>

Within the general terms of transportation improvement - which includes recreational trails and Safe Routes to School programs, funding can be secured for:

- community enhancement (“...promoting economic development; protecting public health, safety, and the environment; enhancing the architectural design and planning of communities; and the positive economic, cultural, aesthetic, scenic, architectural, and environmental benefits of such projects for communities”);
- environmental enhancement (“...environmental restoration and pollution abatement to minimize the impact of transportation projects, control of noxious weeds and aquatic noxious weeds, and establishment of native species”).

The recreational trails program is fully described on the FHWA website:

<http://www.fhwa.dot.gov/safetealul/factsheets/rectrails.htm>

The **US Environmental Protection Agency** <http://www.epa.gov/neleco/uepl/> administers The Urban Environmental Program (UEP) [which] started as a pilot program known as the Urban Environmental Initiative (UEI) in 1995 under the United States Environmental Protection Agency (EPA) in Region I, New England, to address environmental and public health problems in urban cities. The program includes environmental and air quality as well as open space issues.

STATE FUNDING

Commonwealth of Massachusetts: Executive Office of Energy and Environmental Affairs (from EOEa website - <http://commpres.env.state.ma.us/content/urv.asp#>):

<< In 2002 EOEa initiated the **UrbanRiver Visions** to assist communities in creating visions and accompanying action plans for revitalization of their urban riverfronts. This effort grows out of EOEa's ongoing smart growth efforts and assists community leaders in shaping plans that can successfully improve water quality and enhance natural resources while redirecting future growth to the urban core.

<< Riverfront revitalization projects typically involve multiple properties and property owners, abandoned or underutilized factory and commercial sites, brownfield areas and various other challenges which cannot be handled in isolation. A larger-scale integrated approach can lead to the revitalization and preservation of these crucial areas and the creation of greenways and riverfront access for area residents.

<< Program Goals:

- To contribute to the revitalization of the state's existing urban centers which is essential to our long-term success in protecting the environment while promoting economic growth and housing;

- To collaborate with community officials, business owners and residents in developing a vision and action plan for urban riverfronts in selected communities;
- To develop a shared vision through a public participation process that recognizes that renewal of our urban rivers requires a comprehensive approach that incorporates environmental, economic and social perspectives; and
- To leverage support from state, federal and non-government organizations that can assist cities and towns in the implementation of steps in the action plans.

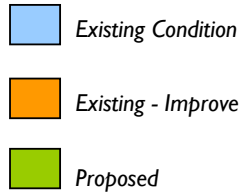
<< Process:

EOEA has worked with Goody, Clancy & Associates (GC&A) and its team of consultants to undertake UrbanRiver Visions. GC&A conducts a charrette in each community, creates a rendering of the vision expressed by the community, and develops a vision and action plan to achieve that vision. In 2007 UrbanRiver Visions 2 will involve six new communities, Grafton, Greenfield, Haverhill, Northbridge, Pittsfield, and Shelburne Falls. They will join the original seven communities of Athol, Chicopee, Easthampton, Fall River, Hudson, Lawrence, and Worcester.>> See page 53 for list of towns and cities studied.

Additional funding from the Commonwealth can be sought from the **Department of Conservation and Recreation** (<http://www.mass.gov/dcr/grants.htm>) which administers grants covering Flood Management; a Recreational Trails Program; and a Flood Mitigation Assistance Program (FEMA grant).

Another source of state funding may be derived through the **Massachusetts Community Preservation Act** that covers affordable housing, open space and preservation and re-use of historic structures, all of which pertains to the situation in Brockton.

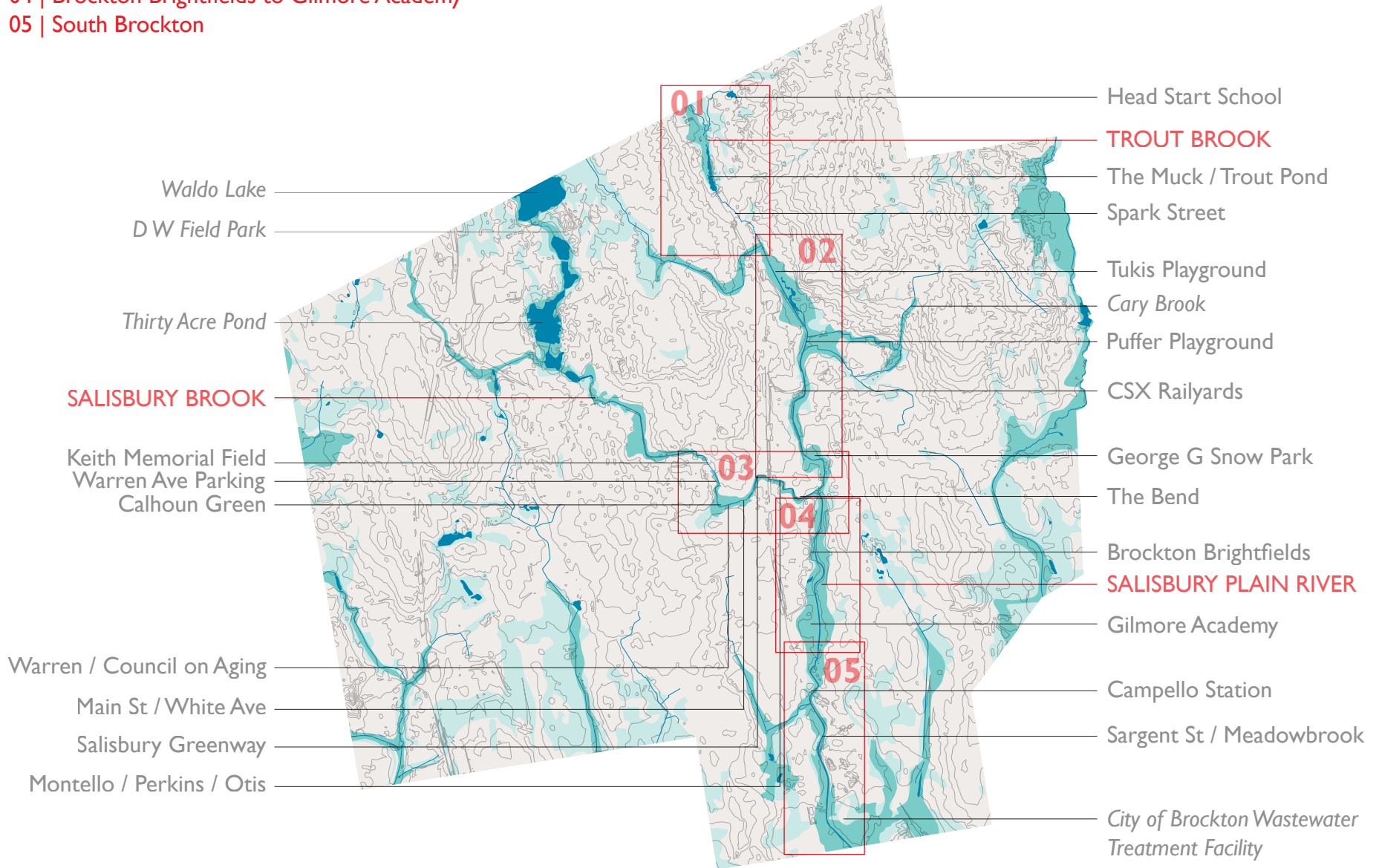
IMPLEMENTATION | Action Matrix



			PHYSICAL STRATEGIES												PROGRAMMING STRATEGIES												PROCESS		
			Hydrology / Flood Control	Soil and Water Remediation	Erosion control	Landscape Naturalization	Landscape Screening	Productive Planting	Wildlife Habitat	Footbridges / Walkways	Sidewalk access	Lighting	Signage	Kiosks	Public Restrooms	Sitting and Looking	Wildlife Observation	Community Gardens	Walking / Bike Paths	Children's Play	Organized Sports	Fishing	Ice Skating	Arts / Cultural Programming	Educational Programming	Public / Private Integration	Public / Community Action	Other Interventions	
01	HOWARD / SPARK																												
01 01	Head Start School																												Housing
01 02	The Muck / Trout Brook Pond																												
01 03	Spark Street																												
02	TUKIS / GEORGE SNOW																												
02 01	Tukis Playground																												Housing Env.Center
02 02	Puffer Playground																												
02 03	CSX Railyards																												
02 04	George G Snow Park																												
03	DOWNTOWN																												
03 01	Keith Memorial Field																												Housing
03 02	Warren Ave Parking Lot																												
03 03	Calhoun Green																												
03 04	Warren Ave to Council on Aging																												Housing
03 05	Main Street to White Avenue																												
03 06	Salisbury Greenway Parks																												
03 07	Montello / Perkins / Otis																												
03 08	The Bend																												
04	BRIGHTFIELDS / GILMORE																												
04 01	Brockton Brightfields																												Alt.Energy
04 02	Gilmore Academy																												Env.Center
05	SOUTH BROCKTON																												
05 01	Campello Station																												
05 02	Sargent St / Meadowbrook																												

- 01 | Howard Street to Spark Street
- 02 | Tukis Playground to George G Snow Park
- 03 | Downtown
- 04 | Brockton Brightfields to Gilmore Academy
- 05 | South Brockton

IMPLEMENTATION | Study Areas



IMPLEMENTATION

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Giddings, Hopwood, Mellor and O'Brien, *Back to the City: A Route to Urban Sustainability in*: Jenks, Mike and Dempsey, Nicola (editors): *Future Forms and Design for Sustainable Cities*, Oxford, 2005

MacBroom, James G., *The River Book - the Nature and Management of Streams in Glaciated Terrains*, Connecticut Department of Environmental Protection Natural Resources Center, Hartford, 1998

McHarg, Ian L., *Design with Nature*, Wiley, New York, 1992

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Specific Studies

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Charles River Watershed Association: Environmentally Sensitive Urban Development: Building Blue Cities - www.charlesriver.org

Charles River Watershed Association: Recommendations for Harvard's Proposed Science Complex - www.charlesriver.org

Dean, Cornelia, *Follow the Silt*, New York Times June 24, 2008 – article on restoration of natural watercourses.

Design Council of the United Kingdom – this organization includes in its scope the design of programs and processes as well as objects. A notable project is their design for healthy living which includes the promotion of walking and exercise programs (“active mobs”) for parks and open space - <http://www.designcouncil.org.uk/en/Case-Studies/All-Case-Studies/Activmobs/>

Groundwork Lawrence: The Spicket River Greenway – building community capacity to renew an urban natural resource - www.groundworklawrence.org

Groundwork Somerville: website includes information on building community gardens - <http://www.groundworksomerville.org>

Sustainable South Bronx: led by Majora Carter, SSB is one of the most progressive programs for the environmental restoration of cities - <http://www.ssbx.org/>

U.S. Environmental Protection Agency / U.S. Army Corps of Engineers: Urban Rivers Restoration Pilot Fact Sheet – Blackstone and Woonasquatucket and Communities, Massachusetts and Rhode Island

U.S. Fish and Wildlife Service, Chesapeake Bay Field Office: Urban River Restoration

Commonwealth of Massachusetts Executive Office of Environmental Affairs - Urban River Visions plans (2002 and 2007)

2002 series

http://commpres.env.state.ma.us/urv_web/Public_Site/atholvision.pdf
http://commpres.env.state.ma.us/urv_web/Public_Site/Chicopee.asp.htm
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2007 series

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<http://www.urbanrivervisions2.org/haverhill.asp>
<http://www.urbanrivervisions2.org/northbridge.asp>
<http://www.urbanrivervisions2.org/pittsfield.asp>
<http://www.urbanrivervisions2.org/shelburnefalls.asp>

AREA 01 | TROUT BROOK
HOWARD STREET TO SPARK STREET



AREA 01 | TROUT BROOK TUKIS PLAYGROUND TO CSX RAILYARDS



AREA 02 | TROUT BROOK
AREA 03 | SALISBURY BROOK

GEORGE G SNOW PARK
WEST ELM STREET TO GROVE STREET



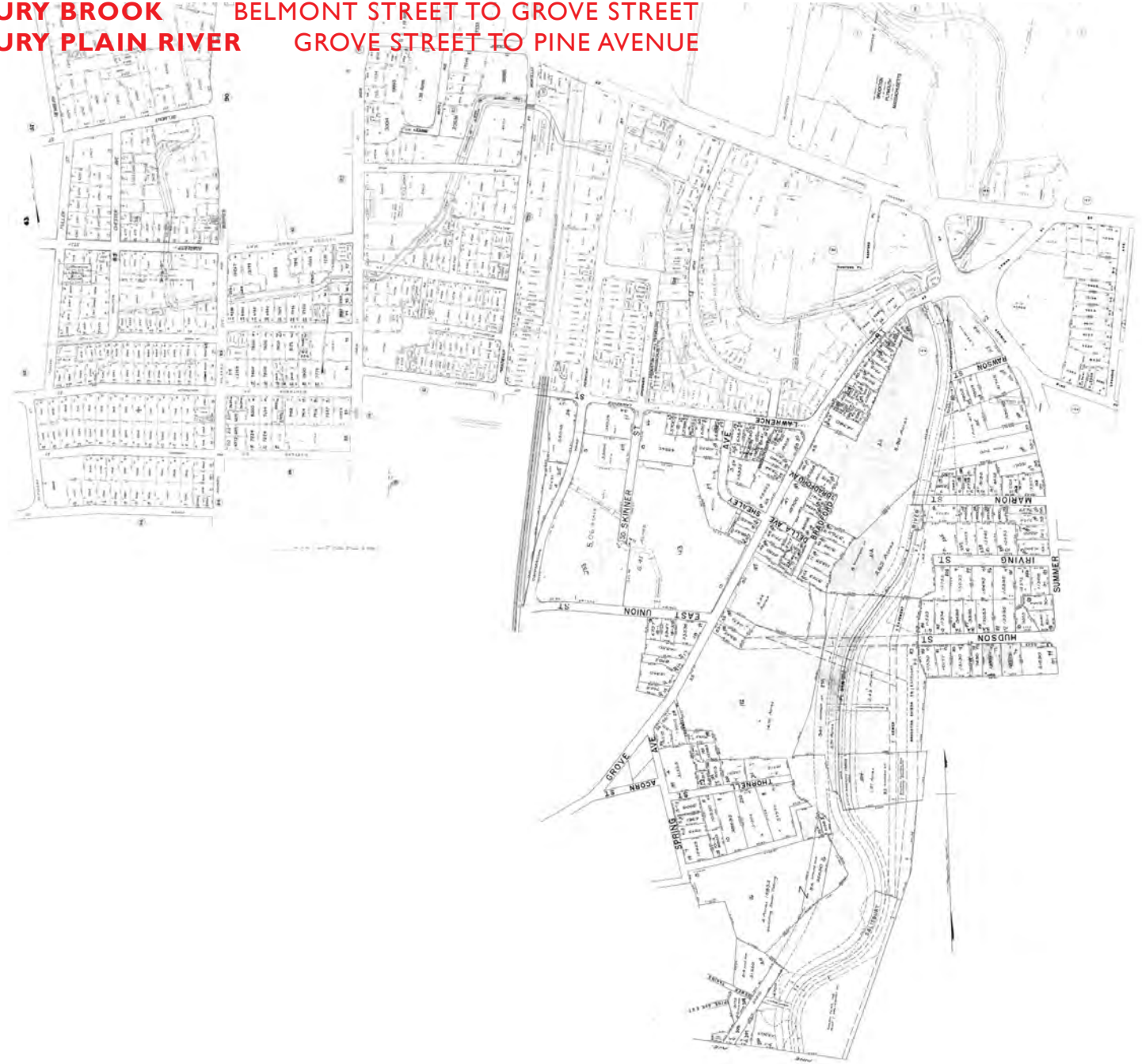
AREA 02 | TROUT BROOK
AREA 03 | SALISBURY BROOK

GEORGE G SNOW PARK
WEST ELM STREET TO GROVE STREET



AREA 03 | SALISBURY BROOK
AREA 04 | SALISBURY PLAIN RIVER

BELMONT STREET TO GROVE STREET
GROVE STREET TO PINE AVENUE





AREA 04 | SALISBURY PLAIN RIVER
GROVE STREET TO PINE AVENUE

**AREA 05 | SALISBURY PLAIN RIVER
PINE AVENUE TO MEADOWBROOK**



AREA 05 | SALISBURY PLAIN RIVER
PINE AVENUE TO MEADOWBROOK



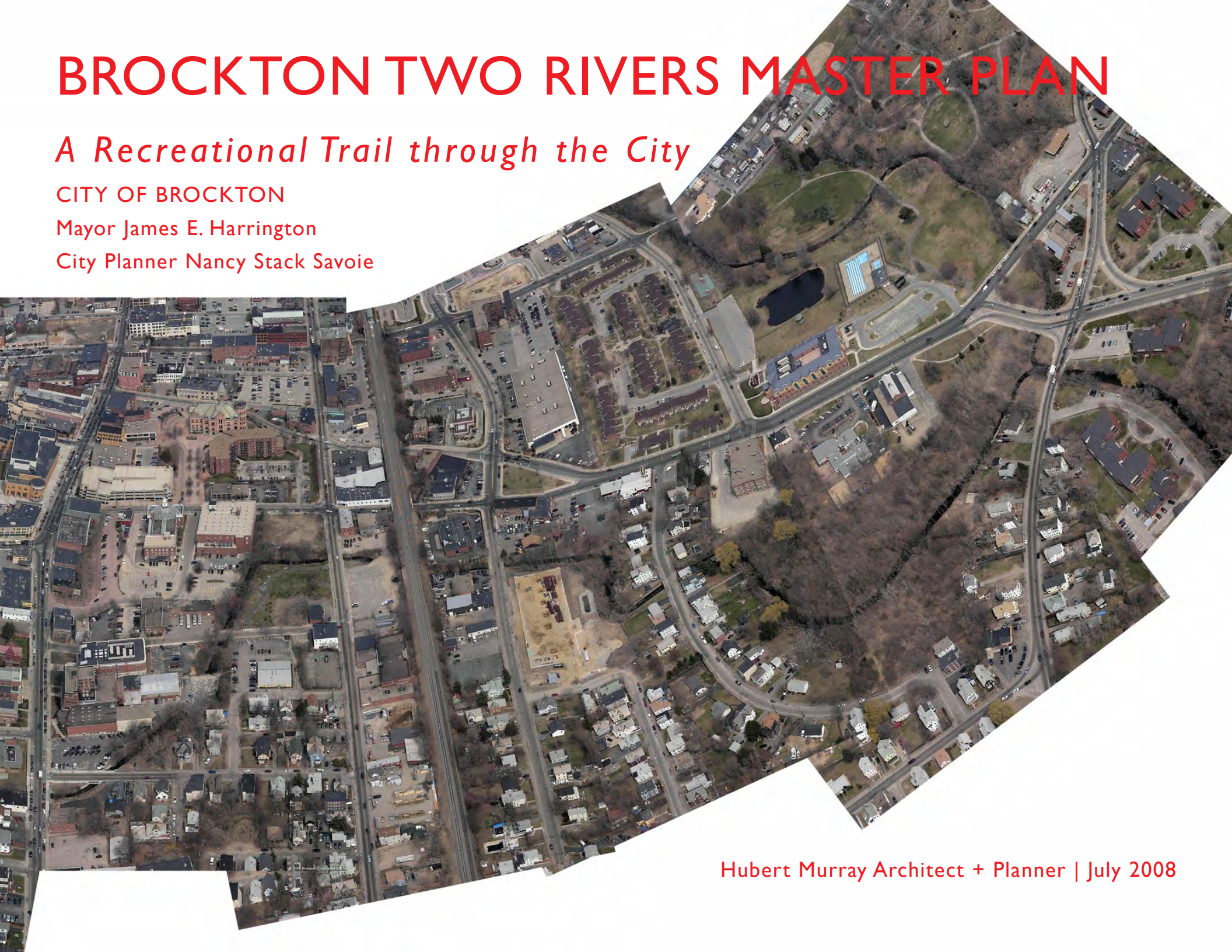
BROCKTON TWO RIVERS MASTER PLAN

A Recreational Trail through the City

CITY OF BROCKTON

Mayor James E. Harrington

City Planner Nancy Stack Savoie



Hubert Murray Architect + Planner | July 2008