# GROWING THE MYSTIC RIVER GREENWAYS

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DEPARTMENT OF URBAN AND ENVIRONMENTAL
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# 1 EXECUTIVE SUMMARY

*"I'd like to see the Mystic get more attention, more funding, more programming, more conservation, more adaptation to resiliency so that it can fulfill all its potential."*

*~State Rep. Mike Connolly*

Flowing from the Mystic Lakes in Winchester to meet the Chelsea River in Boston Harbor, the 7-mile Mystic River has witnessed vast changes throughout history. From European settlers' first shipbuilding projects in the seventeenth century to manufacturing into the twentieth century, the Mystic has long been a center for industry. But as heavy industry fades and the surrounding cities grow increasingly residential, there have been great efforts to restore and re-engage the community with the river in a different way: as a beautiful natural resource to be enjoyed by all.

One such effort championed by our project partner, the Mystic River Watershed Association (MyRWA), is the system of riverside parks and trails known as the Mystic River Greenways. Steady progress has already been made to create a cohesive network of paths for walking, biking, and rolling – 16 miles are completed, 3.5 are designed and funded, and three more are planned.

However, the river and its greenways still face many obstacles: pollution from nearby Interstate 93 and other main roads pose a significant public health threat as well as a physical barrier to the water and trails. Population density is predicted to increase dramatically over the next several decades, and considerable new development is coming in to the area. With this growth comes the potential for even more traffic. According to MyRWA, many local residents are simply unaware of the greenway system—and without awareness, the greenway cannot serve its purpose.

Municipal, academic, and community organizations have worked over the years to study these varying obstacles, while MyRWA has led much of the advocacy and implementation. However, this work has mostly consisted of separate initiatives. This report brings together efforts from a wide variety of groups that have worked to improve the Mystic River Greenways while also considering the watershed's past, present, and future.

We seek to provide answers to the following research questions:

- ***What are the obstacles to healthy enjoyment of the Mystic River and its greenways?***
- ***How will investment in the greenway system improve active transportation and open space recreation for the communities in the Mystic River watershed?***
- ***What policy and planning solutions can we recommend?***

Based on the identified challenges faced by the greenway system, we have developed three main focus areas for our study: access, health, and activation. We focused our geographic scope for this study to a four-mile trail centrally located along the river that we have named the Mid-Mystic Loop. Through expert interviews, route audits, community surveying, reviewing academic literature and existing plans, and researching other similar greenway initiatives, we have found the following:

ACCESS: The presence of I-93 and several other high-speed arterial roads located within walking and biking distance from the Mid-Mystic Loop prevent pedestrians and bicyclists from safely getting to the Mystic Greenways.

HEALTH: Air and noise pollution from I-93 poses a health risk for greenway users, but this is primarily within 200M from the highway on cold winter mornings. Ambient noise from the highway also causes elevated stress in greenway users within hearing distance.

ACTIVATION: Without proper signage and programming, many neighbors remain unaware of the greenway system, where it goes, or that it is available for public use.

Many of our recommendations address two or more of our three focus areas. Sound walls along I-93 would block both noise pollution and the most dangerous concentrations of air pollutants, while also creating an opportunity for public art and greenway visibility. Streetscape improvements at the identified "problem intersections" would make walking or biking to the river an easier and more comfortable experience. Increased signage and improved infrastructure design (i.e. benches, play structures, etc.) would make the parks a more engaging place, and can be situated in a manner that would encourage park users to gather away from the most dangerous pollution concentrations.

We hope this report will serve as a helpful resource for future greenway projects, particularly as more funding arrives in the surrounding communities from increasing development. With our extensive research and detailed findings, we aim to demonstrate to funders why the Mystic River Greenways are such a worthy project for this region. While numerous local, state, and community actors have planned and studied the area, few recommendations from these plans have been implemented.

**For the Mystic River and its greenways, it's time to stop planning and start doing.**

# 2 LIST OF TABLES AND FIGURES

# 3 INTRODUCTION


***"The Mystic River Watershed is the most urban and densely populated watershed in the Commonwealth."***

**~MyRWA**

The Mystic River and its surrounding land have faced a flood of challenges since Europeans first settled the Boston area in the early seventeenth century. Originally the location of Governor John Winthrop's summer home, the Mystic became most well-known as the site of the first launch of the first ship built in Massachusetts—named "Blessing of the Bay"—in 1631. Over 500 clipper ships came to be built along its banks well into the nineteenth century. As the Industrial Revolution boomed and manufacturing spread throughout New England, factories began lining the river. Such industry greatly impacted its water quality and even its path, as it was rerouted, dammed, and straightened to control its drastic tides. [1]

Seen as a highly polluted river—commonly perceived in relation to the eponymous 2003 Clint Eastwood film Mystic River in which it serves as a repository for murdered bodies[2]—this area has been the focus of severe environmental injustice within the last half-century. When Interstate 93 was built to bring suburban traffic into Boston in the 1970's, its immediate proximity to neighborhoods in Somerville and Medford was a clear violation of the Clean Air Act of 1970[3]—and has been degrading the health of residents ever since. Many populations classified as "environmental justice communities" by the state of Massachusetts and the US Environmental Protection Agency, including majority minority census tracts, non-English speaking populations, and low-income families still populate neighborhoods near the Mystic and the adjacent I-93.[4]

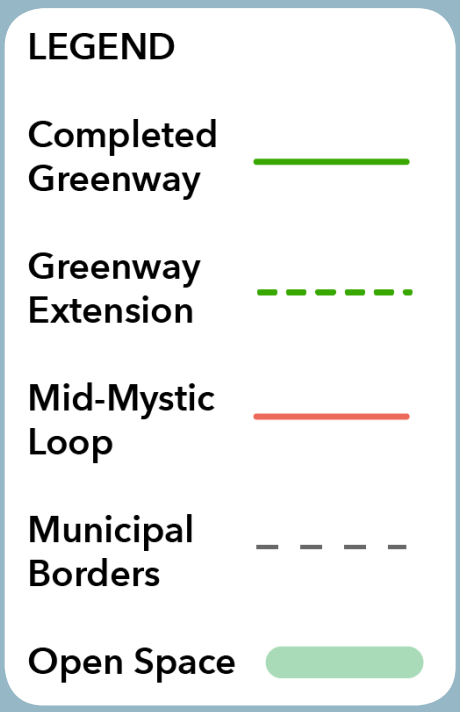
Fortunately, organizations like the Mystic River Watershed Association, est. 1972, have worked hard to improve the water quality, wildlife habitat, surrounding parks, and abutting neighborhoods to highlight the river's value as a natural resource.[5] Presently there are over thirty community groups and state and municipal planning initiatives that are looking at the improvement of the Mystic River and its greenways in some manner. Understanding these efforts and the ways in which they can serve to support each other as they work towards a common goal will be critical for moving forward.

Uniting this work in order to make significant progress is now a matter of urgency. Reports suggest that the population of the Mystic region will drastically increase within the next few decades – particularly with the extension of the Massachusetts Bay Transit Authority's Green Line into Somerville.[6] [7] More businesses are coming into the new mixed-use development at Assembly Row in Somerville, and at the time of this report, the Wynn Casino is under construction on the riverfront in Everett.[8]

So much growth will place further stress the current population – already the most densely populated with the least access to open space in Massachusetts – and the area's natural resources, making investment in the Mystic River and its greenways all the more critical. Many plans have been written, but not much has been implemented. With this new urgency, its time to act.

# GEOGRAPHIC FOCUS AREA: THE MID-MYSTIC LOOP

While the Mystic River Greenways are planned to extend from Winchester to Chelsea, this project aims to make the case for further improvement of the Mid Mystic Loop ("MML"), a roughly four-mile section of existing trails along the Mystic River in Medford and Somerville, particularly in light of intense projected population growth.



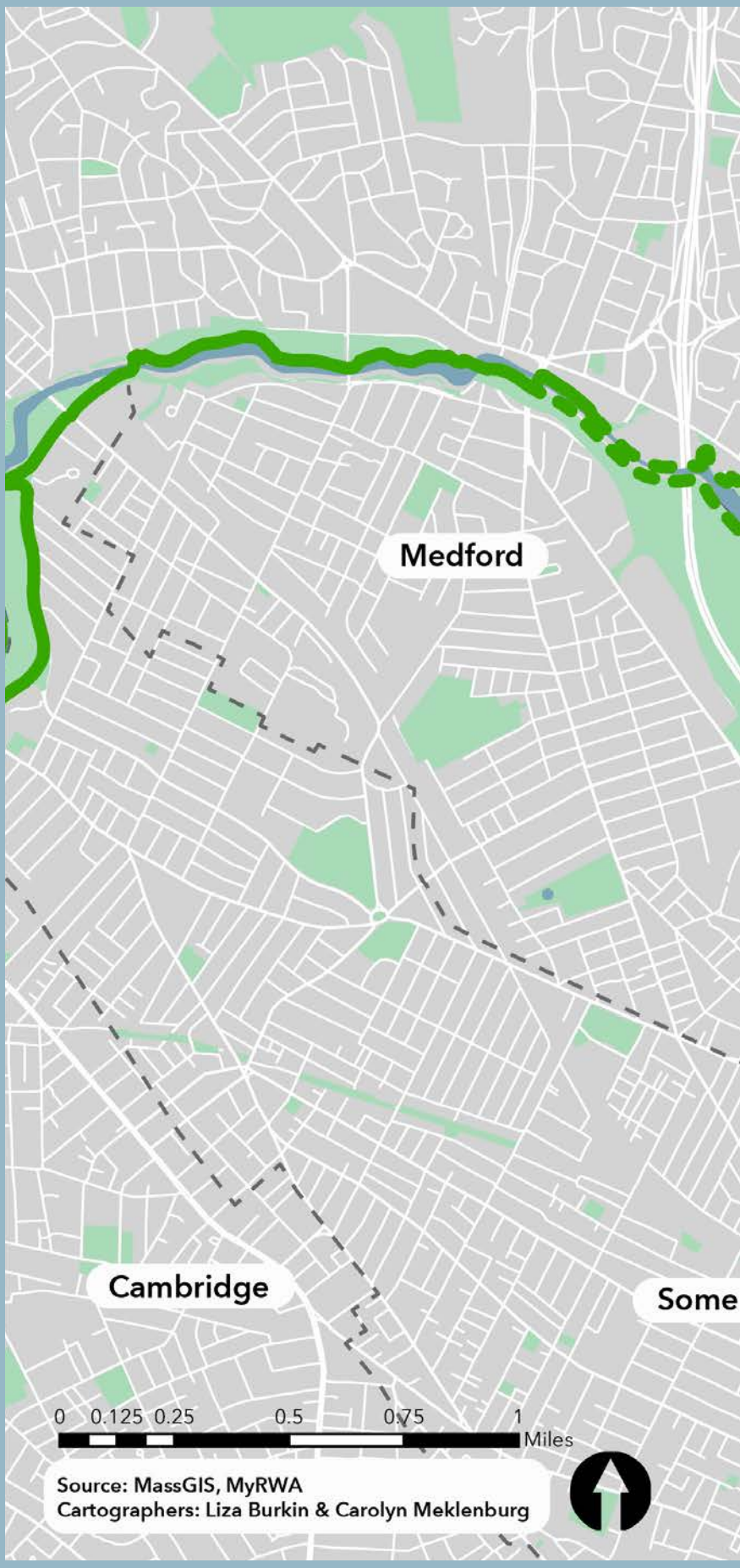
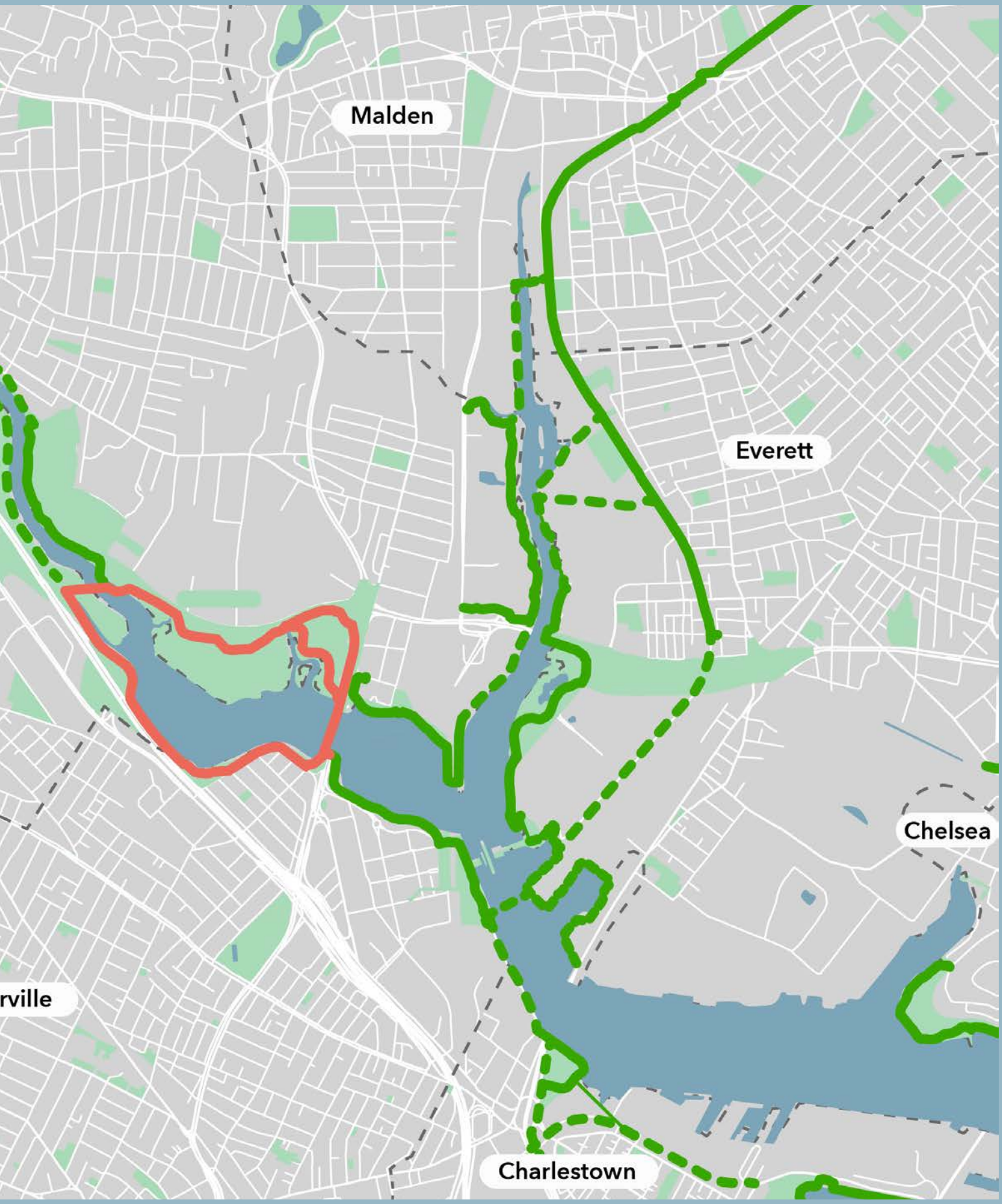




Figure 1. The Mid-Mystic Loop.


Malden
Everett
Chelsea
Charlestown

## GLOSSARY

This report uses many field-specific terms that we define as follows.

**GREENWAY:** A greenway is a long, narrow piece of land, often used for recreation and pedestrian and bicycle transportation, sometimes including multiple transportation (streetcar, light rail) or retail uses.[9]

**GREEN SPACE/OPEN SPACE:** While these are sometimes considered different terms, we use these phrases interchangeably throughout the report to refer to space that is publicly accessible and contains natural elements.

**ACCESS:** a means of approaching or entering a place[10]

**ACTIVATION:** another term for placemaking, a concept that "refers to a collaborative processby which we can shape our public realm in order to maximize shared value. More than just promoting better urban design, placemaking facilitates creative patterns of use, paying particular attention to the physical, cultural, and social identities that define a place and support its ongoing evolution."[11]

**ENVIRONMENTAL JUSTICE COMMUNITY:** a community whose demographics indicate high levels of social vulnerability (i.e. racial/ ethinic minorities, limited English ability, etc.) that has been traditionally "excluded from environmental decision making"[12]

**VULNERABLE ROAD USER:** pedestrians, bicyclists, and other individuals not within a vehicle while using the road[13]

## PROJECT GOALS AND RESEARCH QUESTIONS

We emphasized the following three topic areas:

**ACCESS:** How are people currently accessing the river, and where can the connections be improved? What is the demographic makeup of the neighboring communities, and what are the expected impacts of improved access?


A Community Member Contributes His Ideas For Placemaking During A Brainstorming Session At The Blessing Of The Bay Redesign Meeting Hosted By Myrwa At The Somerville Housing Authority On April 5, 2018.

An overview of work-in-progress to further the development of the Mystic River Greenways

# Current Initiatives

| | ACCESS | HEALTH | ACTIVATION |
|---|---|---|---|
| ACADEMIC | | Community Health Assessment of Freeway Exposure (CAFEH) Study, Tufts University | |
| COMMUNITY/ ADVOCACY | Mystic River Watershed Association<br>Boston Cyclists Union<br>MassBike<br>WalkBoston<br>STEP<br>Livable Streets Alliance<br>East Somerville Main Streets | Somerville Transportation Equity Partnership (STEP)<br><br>Noise and the City | Groundwork Somerville |
| LEGISLATIVE/ STATE | MBTA Green Line Extension<br><br>Fair Share Amendment (2018 ballot measure)<br><br>MassDOT Infra-Space Program: Kensington Underpass, Broadway @ I-93, Gilman Street<br><br>DCR Bicycle and Pedestrian Mystic River Crossing | Bill H.4018 "An Act Providing for Capital Facility Repairs and Improvements for the Commonwealth"<br><br>Bill S.2279 "An Act Providing for Capital Facility Repairs and Improvements for the Commonwealth"<br><br>MOR-EV electric vehicle rebate program | DCR: Blessing of the Bay & Draw 7 Park revitalization and redesign |
| MUNICIPAL | Somerville Bike Committee<br><br>Medford Bicycle and Pedestrian Advisory Commission<br><br>Rutherford Avenue/Sullivan Square Redesign Project | Shape Up Somerville | Medford Square Master Plan<br><br>Somervision<br><br>City of Somerville: Blessing of the Bay & Draw 7 Park revitalization and redesign |
| REGIONAL | MAPC Lower Mystic Walking Routes Program<br><br>Wynn For All "Mystic Mile" Roadway Improvements<br><br>Hubway -> Blue Bike expansion<br><br>MAPC regional dockless bike share | MAPC Health Impact Assessment - Sound Barriers | MAPC Mystic River Corridor Strategy Project |

Figure 2. Current Initiatives Chart.

**HEALTH:** How do urban waterfront recreation areas situated alongside busy highways affect the health of park and greenway users? Our research addresses both noise and air pollution related to the presence of I-93 through the MML. For this topic, we narrowed the geographic scope to the four-mile loop of completed trails.

**ACTIVATION:** What improvements can be made to the MML to best optimize park usership and create more opportunities for regional active transportation? What park features will increase use, visibility, and community ownership of the greenways while not increasing health risks of pollutant exposure?

In compiling this report in both print and multimedia form, we have synthesized the large body of relevant community plans, initiatives, and secondary research to communicate the need for further investment in the Mystic River Greenways, and the work that is already underway.

## LIMITATIONS

As this report was written to fulfill the requirements of an academic course, our study has been limited by the time constraints of an academic semester. This has impacted some of our methods.

## FOCUS AREA

The Mystic River Greenway connects with the Alewife Brook Greenway, the Northern Strand Community Trail, and the Malden River Greenway. We limited our focus to the Mid-Mystic Loop and its surrounding walking and biking routes because it is a completed, continuous section of trail that is currently underutilized. Our research and recommendations for creating an accessible, healthy and dynamic Mid-Mystic Loop can be applied to the entire greenway system.


Community Members Discuss Their Ideas For Park Improvements At Blessing Of The Bay Redesign Meeting On April 5, 2018.

## SURVEY SAMPLE SIZE

Although there are a wide variety of languages spoken throughout the watershed, our resources limited our translations to just two other languages besides English: Spanish and Portuguese. However, we did not receive any online responses in a language other than English, nor did we encounter anyone in person who preferred to take the Spanish or Portuguese translation. While distributing surveys in-person, we noted other languages being spoken by park users that were neither English nor Spanish nor Portuguese.

While we reached out to a wide variety of organizations, a large proportion of our responses came from bicycle advocacy groups and supporters of the Mystic River Watershed Association. We recognize that this may be a biased population, as many of these individuals already have an informed perspective on the greenways. Addtionally, from the demographic information collected in our surveys, we know there is a discrepancy between the racial/ethnic make-up of survey respondants (mostly non-Hispanic white) and the surrounding community (see "Figure 5. Social Vulnerability Index")

Endnotes

1 "River History."
2 "Mystic River - Google Search."
3 Wig Zamore, interview.
4 "MassGIS Data: 2010 U.S. Census Environmental Justice Populations | Massachusetts Document Repository."
5 "About Us."
6 "SomerVision | City of Somerville."
7 "Mystic Avenue Rezoning Study Presentation from March 28, 2018."
8 "MassBuilds."
9 "What Is a Greenway? | GreenWay."
10 "Access | Define Access at Dictionary.com."
11 "What Is Placemaking?"
12 "Access | Define Access at Dictionary.com."
13 SWOV: Institute for Road Safety Research, "Factsheet: Vulnerable Road Users."

# METHODS

To meet our project goals, we engaged in both primary and secondary research.

## PRIMARY RESEARCH

### Surveys: Online and In-Person

Research question addressed: *What is the demographic makeup of the community we are serving, and what are their obstacles to healthy enjoyment of the Mystic River and its greenways?*

We distributed an online survey through social media and email, particularly focusing on local biking groups. The survey addressed:

- Demographic information: race, gender, language spoken in household, income bracket, primary mode of transportation and location of residence in relationship with the Mystic River
- Experience with Mystic River: Do you interact with the Mystic River? If yes, how? If no, why not? What could improve your experience with the Mystic River?
- Routes and barriers: What route would you take to access the Mystic River from your home? What are the problem areas that prevent you from being able to safely bike and walk to/across the river?
- Contact information: Would you like to be contacted to speak further about the project?

The in-person survey asked the same questions, with the exception of the mapping component. We distributed this survey at both Blessing of the Bay and MacDonald Parks, as well as at community meetings. We collected 212 responses, 167 online and 45 in person.

### Crowdsource Map

Research question addressed: *Where are the on-street problem areas that prevent comfortable biking and walking to/across the Mystic River?*

We used Esri's Crowdsource Story Map tool to collect information from community members about where the worst problem areas are in preventing safe walking and biking access to the river.

### Walking and Biking Route Audits

Research question addressed: *How are people currently accessing the river, and where can the connections be improved?*

We identified key local destinations within a ~2-mile area of the Mystic River and performed walking and biking route audits to assess safety and comfort. On these route audits, we considered ways in which to improve pedestrian and bicyclists safety and wayfinding, recommendations that we include in our Holistic Approach section.

### Interviews

Research question addressed: *How will investment in the greenway system improve active transportation and open space recreation for the communities in the Mystic River watershed?*

We interviewed relevant city government employees, non-governmental community organization leaders, individuals involved in analogous projects, and subject-matter experts.

## SECONDARY RESEARCH

**Case studies**
Research question addressed: *How have other organizations improved public health of, access to, and activation of urban greenways, particularly near congested transportation corridors?*
Each group member researched a different greenway in an area of the United States analogous to the Mystic River watershed. A greenway was considered analogous to the Mystic if it is in an urban area, along a secondary river, and/or in proximity to a major highway similar to I-93. This information was gathered from organizational websites, news articles, academic articles (if relevant), and informant interviews. We selected the following greenways:

- Woonasquatucket River Greenway, Providence, Rhode Island
- Concord River, Lowell, Massachusetts
- Bronx River, Bronx, New York
- Charles River, Boston, Massachusetts

**Interview and Literature Review: Air & noise pollution mitigation best practices**
Research question addressed: *How do urban waterfront recreation areas situated alongside busy highways affect the health of park and greenway users?*
We interviewed Doug Brugge, Wig Zamore, and Erica Walker on the public health problems caused by the presence of I-93 alongside the Mystic River Greenway. Both Dr. Brugge and Mr. Zamore provided insightful information on their work with the Community Assessment of Freeway Exposure and Health (CAFEH) project in the Boston area. Similarly, as a community noise researcher and founder of Noise and the City, Ms. Walker provided valuable information about her field of study. In addition to the information provided, we conducted an academic literature search and compiled literature reviews on the impacts of air and noise pollution on communities, particularly in relationship to urban parks and greenways.

*Interview and Census Data Collection: Past, Present and Future Demographics*
Research question addressed: *What is the demographic makeup of the community we are serving, and how has it changed overtime? How is it expected to change with the major development expected in this area?*
We gathered data from the U.S. Census Bureau and the Center for Disease Control to determine the present demographic makeup of the project area as well as historical demographic trends. Present demographics helped us to better understand who the current/target users of the greenway system are, and how we can improve the area to meet their needs (i.e. multilingual signage). Historic research helped us better understand the relationship between the community and the Mystic River as it has shifted over time. We also conducted interviews with staff members of the Metropolitan Area Planning Council (MAPC) who have done population projection studies to get a sense of how many people the greenway system will be serving in the near future. This gave us a sense of improvements that must be made to accommodate growth.

# 4 THE ONCE AND FUTURE WATERSHED

*"The name 'Mystic' is derived from the Indian word 'MissiTuk' or 'great tidal river'..."*

**- Mystic River History, MyRWA**

## PAST

The character of the Mystic River has changed dramatically over time. Named by indigenous tribes for its vast tidal fluctuations, the "Missi-tuk" was once an abundant source of fish for America's earliest peoples. Once European settlers arrived, the river served as the launch point for the first ship built in America by Europeans. In 1631, the clipper ship known as "Blessing of the Bay," now the name of a well-known park within the greenway system, left its shores.

This was just the beginning of industry along the Mystic: throughout the nineteenth century, the river's ten shipyards had constructed over 500 clipper ships. But demands of industry required the Mystic to literally change its course: the Craddock Locks and the Amelia Earhart Dam halted the tides for which the river was named.[1]

Not everyone had such an industrial vision for the Mystic. On January 2nd, 1893, Charles Eliot, former apprentice of the famed landscape architect Frederick Olmsted, put forward a report identifying the available lands to preserve for the improvement of the Boston metropolitan community.[2] This included the Charles River Esplanade and what is now the Mystic River Greenways. Eliot's report was accepted, and industries started to leave the Charles River allowing for its future restoration.

The Mystic River, however, was not able to stave off manufacturing companies, leaving no space or attraction for the same wealthy residents and anchor institutions that flocked to the banks of the Charles. While the Charles River serves the upper-class neighborhoods of Back Bay and famous universities like Harvard and MIT, the Mystic was and is home to a number of environmental justice communities, as well as manufacturing sites that included the Converse rubber plant and a Monsanto sulfuric acid plant.[3] The result has been adoration for the Charles, and dismissal of the Mystic.

The introduction of Interstate 93 in the 1970's further degraded the Mystic River and its public perception. I-93 was unpopular among residents of Somerville but it's construction was allowed to continue despite a moratorium on highway construction in cities.[4] [5] In fact, its presence violated the Clean Air Act of 1970, emitting high concentrations of pollutants that would impact the dense surrounding neighborhoods.[6]

The once "great tidal river" and its shores thus became a victim of pollution from all sides—land, water, and air. In 1972, the Mystic River Watershed Association was founded to reinvigorate the health of the river and its surrounding communities. Industry has since faded along the river, but its landscape and ecology have yet to fully recover.[7]

## PRESENT

Home to about 596,951 people in 22 cities and towns, the Mystic River watershed is the densest in the state—and is growing quickly.

### COMPARING WATERSHEDS: A GIS ANALYSIS

Using 2010 census block groups and the area in square miles of each watershed in Massachusetts, it is apparent that the Mystic Watershed holds the highest population density of all watersheds throughout the Commonwealth at 6,815 people per square mile.

Considering that this census data is almost ten years old at the time of this report, recent development suggests that this population density may have since increased.

This density is significant considering the proportional amount of open space within the watershed. By dividing the total acres of open space (last updated by MassGIS in March, 2018) by the total acres of land within each watershed, the Mystic has some of the least acreage of open space in the state.

It is interesting to note that it has less proportional open space than the Charles River watershed, which is also a heavily urbanized area. With the densest population but some of the least acreage of open space, the Mystic River Watershed is clearly disadvantaged in comparison with the rest of Massachusetts.

## CURRENT POPULATION

Presently, the neighborhoods around the Mystic River Greenways are home to many minority and immigrant communities. Low-income populations are also concentrated in this area, particularly compared with the rest of the watershed. With such characteristics, these populations are considered environmental justice communities in accordance with EPA standards, the State of Massachusetts, and current literature.[8 9]

We mapped these demographics separately using information from the most recent American Community Survey distributed by the US Census Bureau (see Appendix D), but to get a more holistic view of this area, we have also created a "Social Vulnerability Index" map using data from the Center for Disease Control's Agency for Toxic Substances & Disease Registry (ATSDR). While the CDC explains social vulnerability as "the resilience of communities when confronted by external stresses on human health, stresses such as natural or human-caused disasters, or disease outbreaks,"[10] social vulnerability can also be used to identify populations that are generally disadvantaged.

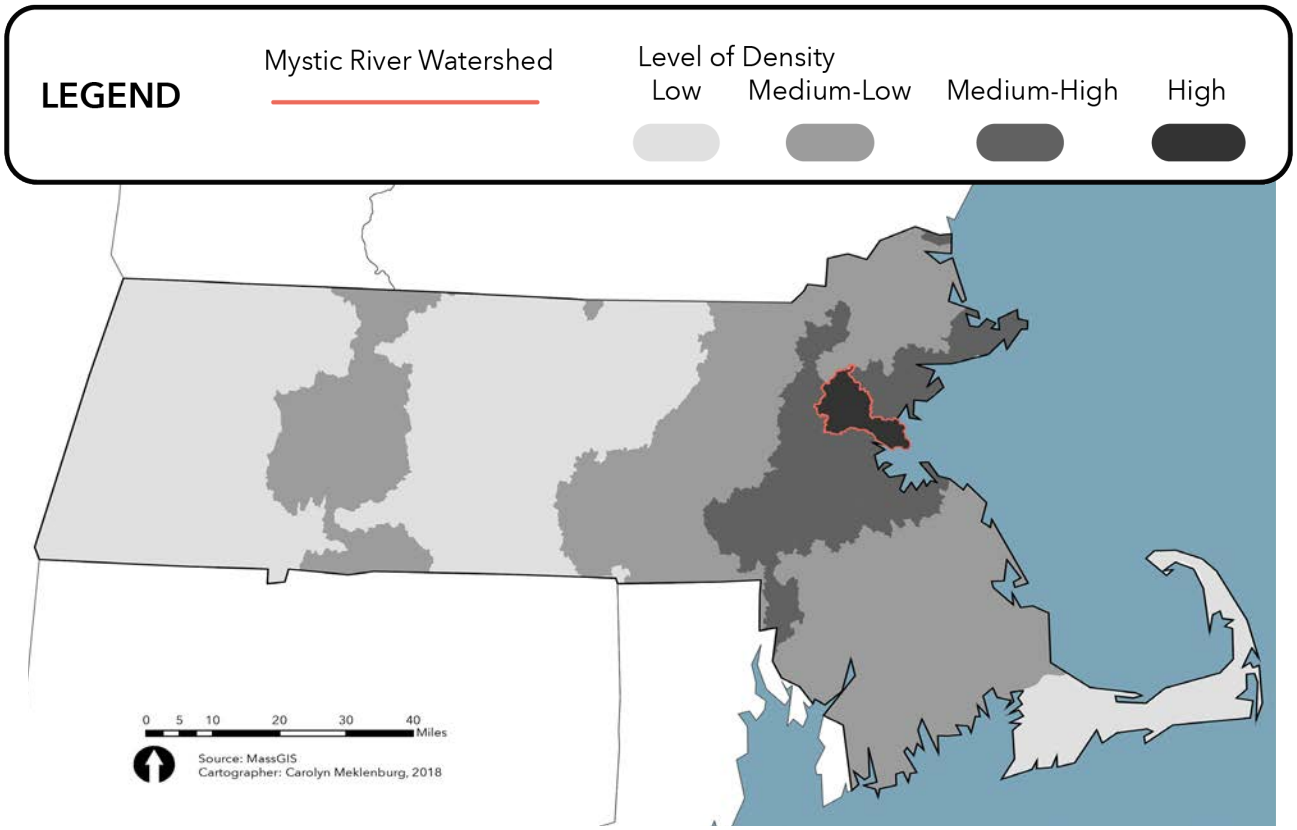



Figure 3. Population Density Per Watershed In Massachusetts.

## WHY DOES OPEN SPACE MATTER?

While we are not focusing on all the aspects listed below, it is important to recognize the role of open space in communities to better understand the significance of the lack of open space in the Mystic River Watershed.

### PEOPLE LIKE PARKS

In general, people like open space. Much of the literature mentions this inherent connection that people feel with the natural world, and so we want to be near it.[11] [12] [13] Baur et al. studied people's opinions of "urban nature parks" in Portland, Oregon, and found that even people who did not regularly use parks still wanted to incorporate them into their neighborhoods.[14] Pincetl and Gearin looked into attitudes that people of color hold towards green space. While social groups may use parks for different purposes, they found that all racial groups in the study area of Los Angeles expressed a desire for increased green space in their communities.[15]

### OPPORTUNITIES FOR PHYSICAL ACTIVITY

Much research has recently explored the relationship between an individual's physical activity and the nature of their environment:[16] the presence of an aesthetically-pleasing green space is likely to encourage more physical activity.[17] While many studies show a strong relationship between these variables—the presence of green space and level of physical activity—others demonstrate that this correlation is only strong when the green space can be easily accessed by community members.[18]

### ECOSYSTEM SERVICES

There is a large body of literature on the benefits of urban green space in terms of the ecosystem services they provide. Green space has been shown to directly increase quality of life by improving our health. As mentioned, in providing space for recreation, green space encourages physical activity.[19] Green space (particularly when it contains trees) has also been shown to improve air quality, a critical service for urban areas where pollution is often a more significant problem.[20] [21] [22] What seems less obvious are the mental health benefits that green space provides: many studies suggest that interacting with elements of nature reduces stress.[23] [24] [25] Wood et al. even found that, in addition to reducing mental illness, being around nature encourages positive mental wellness.[26] Such benefits are particularly important for environmental justice communities, as low-income populations often experience intense stress but are less likely to have access to green space and natural views that may provide some relief.[27]

Urban green space indirectly improves quality of life with the ways in which it can mitigate harmful impacts of climate change. Particularly when it includes trees, green space has a cooling effect on surrounding air temperatures.[28] [29] [30] In addition to providing shade, strategically-placed trees may protect nearby buildings from wind.[31] All of these temperature-regulating effects have been shown to reduce energy costs; Nowak et al. includes very specific cost saving data in their study on urban forests.[32] Of course, energy cost reduction means less energy use, and thus less greenhouse gas emissions. Urban green space mitigates climate change further since trees absorb and sequester carbon.[33] [34] [35]

The geographic area used for these maps corresponds with the distribution of local destinations that we have identified around the Mystic River as critical hubs from which most people are likely to travel (see our section on "Access"). This area encompasses an area of about 2-3 miles from the river, which is generally accepted as a reasonable walking/biking distance (approximately 15-20 minute bike-ride).

### SAMPLE POPULATION: DEMOGRAPHICS REPRESENTED IN SURVEY

To gather community feedback on the current greenway system and what changes to the system they would like to see, we distributed a survey that also asked for demographic informatiown (on a voluntary basis). Unfortunately, our sample did not capture the rich diversity of the watershed: 89% of participants identified as white, 94% of participants identified as non-hispanic, and 94.5% of participants identified English as the primary language of their household.

## FUTURE

As this report is being compiled, there are countless municipal and regional bodies, corporations, organizations, and initiatives talking about the future of the Mystic River. These plans are all connected through common themes, many of which will be discussed in the body of this report. While these plans exist for many cities and various regions within the watershed, we have limited our research to the cities through which our focus area of the Greenway pass: Medford, Somerville, and Everett.

## COMMON THEME: GROWTH

Many of these plans grapple with the vast levels of growth that this region is anticipating over the next several decades. SomerVision, Somerville's first comprehensive plan published in 2012, explains, "Our nation is experiencing

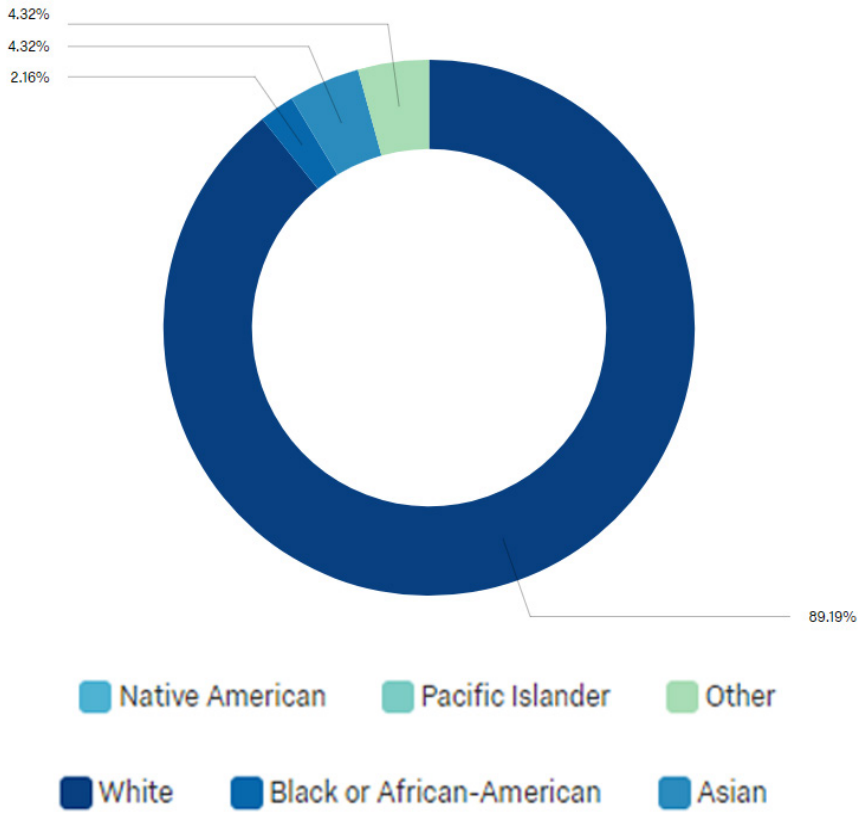



Figure 4. Identified Race Of Survey Participants

an urban renaissance, and there is a tremendous demand for housing in places like Somerville. A recent study by the national research group Reconnecting America estimates that market demand for new housing close to rapid transit exceeds 600,000 housing units for metro Boston. That translates to roughly 2,000 new housing units for existing and new station on the MBTA system."[36] To put this into perspective, with the anticipated extension of the MBTA Green Line, there will be six new transit hubs in Somerville, in addition to its existing two—which would translate into an estimated demand for 16,000 new housing units in the densest city in the state. As of now, SomerVision plans for 5,100 new housing units. New commercial development in Somerville will produce about 25,000 new jobs by 2030—and by then, the overall city population is predicted to push 100,000 residents.

By 2040, Medford's population is expected to increase by over 8,000 people; they, too, do not currently have enough housing to meet this demand.[37] The Green Line extension project has plans for at least one new transit station in Medford, with the possibility of another if funds become available for a station on Mystic Avenue (a main thoroughfare through the city).[38] The construction of Wynn Casino in Everett is predicted to bring in more than 4,500 permanent jobs in addition to the 4,000+ construction jobs its development will generate.[39] While said jobs will not necessarily be taken by new residents—in fact, the casino has pledged to prioritize the hiring of current residents[40]—the casino is predicted to bring 20,000 carloads of visitors per day[41]—upon completion.

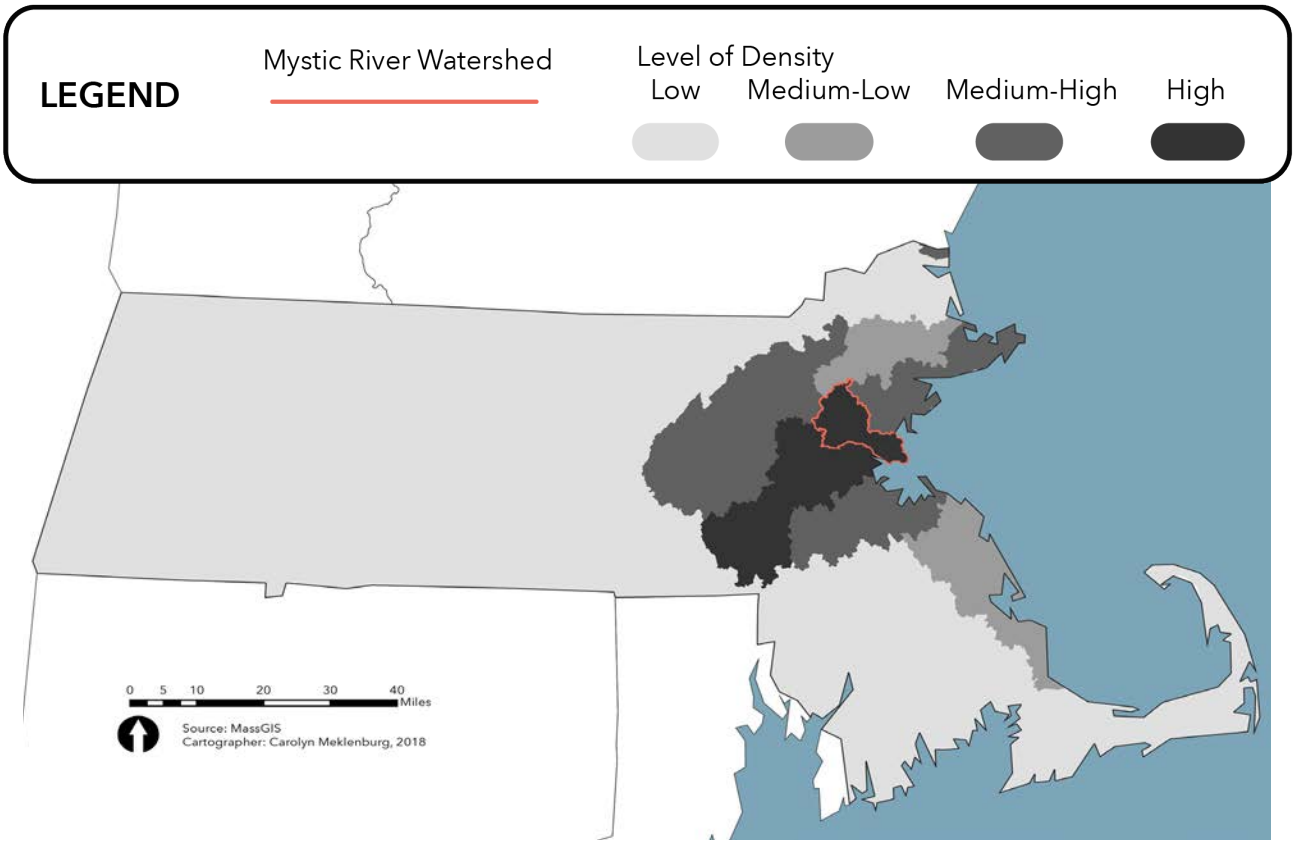



Figure 5. Density Of Future Development By Watershed In Massachusetts.

# SOCIAL VULNERABILITY INDEX

The Index is created by overlaying fifteen different social characteristics– many of which are used in identifying environmental justice communities– and assigning a score between 0 and 1 to each census tract with 0 indicating no social vulnerability, and 1 indicating extreme social vulnerability. The factors used to create these scores are as follows: poverty level, unemployment, income, lack of high school diploma, age 65 or older, age 17 or younger, disability status, household structure (single-parent), race and ethnicity, English ability, housing structure (multiple unit, group quarters, mobile home, etc.), tract density, and vehicle ownership. To simplify the index, this map displays four levels of social vulnerability.

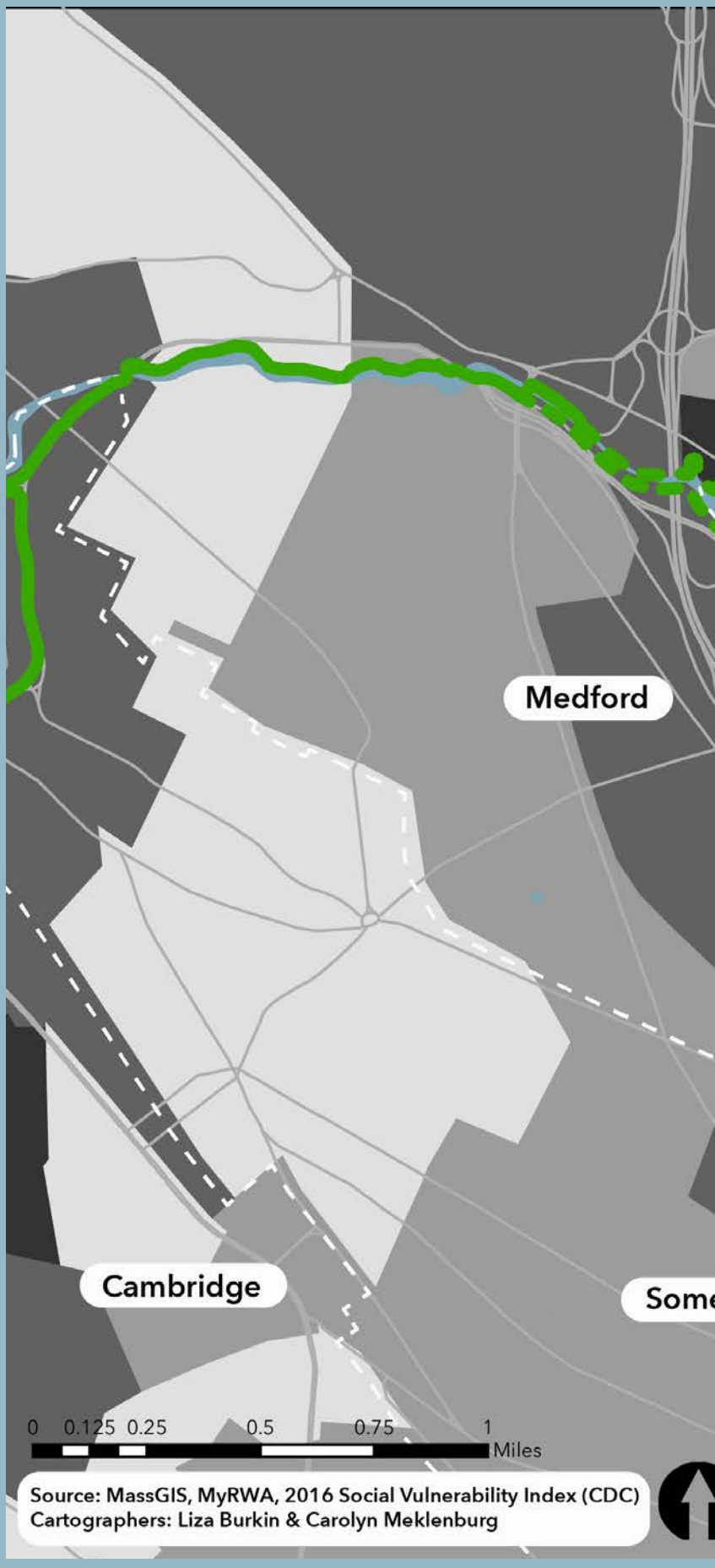



Figure 5. Social Vulnerability Index.


Malden
Everett
Chelsea
Charlestown

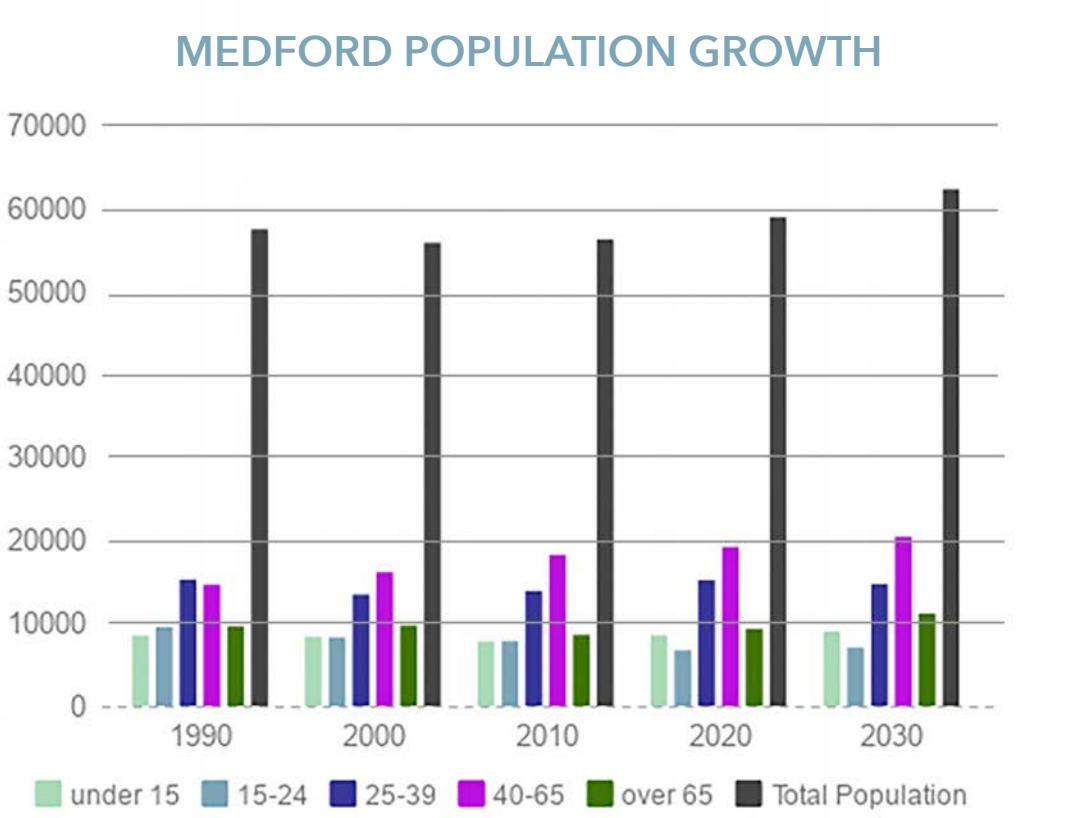



Figure 7. Projected Population Growth In The City Of Medford. Source: MAPC

## COMMON THEME: TURNING AWAY FROM CAR-ORIENTED TRANSIT

With such anticipated growth, many municipalities are acknowledging that current transportation infrastructure cannot handle a similar influx in vehicles. Thus, Medford, Somerville and Everett have all committed to fostering bike-able and walkable communities, whether through improvements to current vehicle-oriented infrastructure or by encouraging developments appropriately laid out for bikers and pedestrians.

Of course, the Green Line extension will allow for more public transit—and Somerville has emphasized the importance of creating mix use developments around the new transit stations that will further encourage biking and walking in addition to using public transportation.[42] In anticipating the use of shuttle buses to the casino from various transit hubs, the Everett transportation plan really emphasizes the importance of bus-only lanes and other improvements to busing infrastructure.[43] Wynn Coroporation has pledged to invest $264 million over fifteen years in infrastructure improvements to accommodate the increase in traffic the casino will cause, including critical changes to some of the area's most problematic traffic circles/intersections such as Sullivan Square, Sweester Circle, and Sintilli Circle (see our "Access" chapter for more on these improvements).[44]

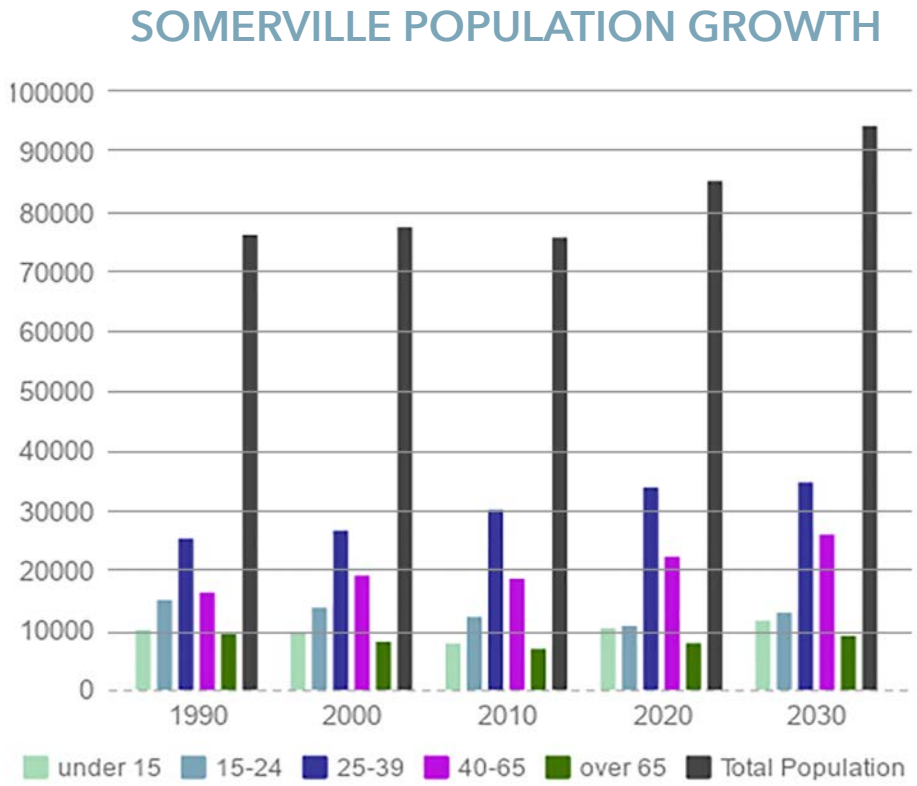



Figure 8. Population Growth In The City Of Somerville. Source: MAPC

## COMMON THEME: THE ROLE OF THE MYSTIC AND GREENSPACE

Most importantly, these plans all emphasize the value of the Mystic River as a feature of the community that must be nurtured, celebrated, and protected—not an industrial waterway to be ignored. Priority number four of the Medford Square Master Plan states, "Highlight the Mystic River as a central feature. The Square should leverage its position on the Mystic with active riverfront edges, recreational paths, new or improved open spaces, and creative ways to engage or interpret the historical relationship to the river."[45] SomerVision excitedly announces that "Somerville has a waterfront!" It further explains, "More than two miles of shoreline along the Mystic River and the Alewife Brook provide walking, boating and fishing opportunities for Somerville residents and visitors. We should be proud of these resources and work to improve accessibility, water quality and publicity."[46] Even Wynn boasts that their casino will be "situated on the waterfront along the Mystic River."[47] Naturally, every plan ties opportunities to improve access to the Mystic River with opportunities to expand open space, something consistently expressed as a community value shared throughout the region.

On the following page is a list of the plans that we have found that emphasize connectivity to and along the Mystic River in some fashion. The following chapters on Access, Health and Activation feature a table outlining which elements of these plans are referenced within the chapter.

## REGIONAL PLANS

- **Mystic River Master Plan**

  *Lead*: Massachusetts Department of Conservation and Recreation (DCR)
  *Year*: 2009
- **Lower Mystic Corridor Strategy Project and Update**

  *Lead*: Metropolitan Area Planning Council (MAPC)

  *Year*: 2009
- **Lower Mystic Walking Routes**

  *Lead*: MAPC

  *Year*: 2014

## MUNICIPAL AND NEIGHBORHOOD PLANS

- **Medford Square Master Plan**
  *Lead*: MAPC/City of Medford

  *Year*: 2017
- **Winter Hill Neighborhood Plan**

  *Lead*: City of Somerville

  *Year*: 2016
- **Wynn For All**

  *Lead*: Wynn Casino

  *Year*: 2018
- **Healey School Master Plan**

  *Lead*: City of Somerville

  *Year*: 2017
- **Somervision**

  *Lead*: City of Somerville

  *Year*: 2012
- **Everett Transit Action Plan**

  *Lead*: Massachusetts Department of Transportation MassDOT

  *Year*: 2016
- **Chelsea Open Space and Recreation Plan**

  *Lead*: City of Chelsea

  *Year*: 2010
- **Blessing of the Bay Redevelopment**

  *Lead*: MyRWA and Groundworks Somerville

  *Year*: In process
- **MacDonald State Park Redevelopment**

  *Lead*: DCR

  *Year*: In process
- **Medford Open Space Plan**

  *Lead*: City of Medford

  *Year*: 2011
- **MAPC Health Impact Assessment**

  *Lead*: MAPC

  *Year*: In process
- **MacDonald Park Improvements**

  *Lead*: DCR

  *Year*: 2016

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12. Nesbitt et al., “The Social and Economic Value of Cultural Ecosystem Services Provided by Urban Forests in North America,” 104.
13. Grove, J. Morgan, “Cities: Managing Densely Settled Social-Ecological Systems,” 291.
14. Baur, Tynon, and Gómez, “Attitudes about Urban Nature Parks.”
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16. Coutts, “Greenway Accessibility and Physical-Activity Behavior,” 552.
17. Coutts and Hahn, “Green Infrastructure, Ecosystem Services, and Human Health,” 9781.
18. Coutts and Hahn, 9781.
19. Nesbitt et al., “The Social and Economic Value of Cultural Ecosystem Services Provided by Urban Forests in North America,” 105.
20. Kim, Miller, and Nowak, “Assessing Urban Vacant Land Ecosystem Services.”
21. Vieira et al., “Green Spaces Are Not All the Same for the Provision of Air Purification and Climate Regulation Services.”
22. Nowak et al., “Residential Building Energy Conservation and Avoided Power Plant Emissions by Urban and Community Trees in the United States.”
23. Pasher et al., “Assessing Carbon Storage and Sequestration by Canada’s Urban Forests Using High Resolution Earth Observation Data.”
24. Bratman, Hamilton, and Daily, “The Impacts of Nature Experience on Human Cognitive Function and Mental Health.”
25. Nesbitt et al., “The Social and Economic Value of Cultural Ecosystem Services Provided by Urban Forests in North America.”
26. Baur, Tynon, and Gómez, “Attitudes about Urban Nature Parks.”
27. Wood et al., “Public Green Spaces and Positive Mental Health – Investigating the Relationship between Access, Quantity and Types of Parks and Mental Wellbeing.”
28. Baur, Tynon, and Gómez, “Attitudes about Urban Nature Parks,” 100–101.
29. Vieira et al., “Green Spaces Are Not All the Same for the Provision of Air Purification and Climate Regulation Services.”
30. Pasher et al., “Assessing Carbon Storage and Sequestration by Canada’s Urban Forests Using High Resolution Earth Observation Data.”
31. Grove, J. Morgan, “Cities: Managing Densely Settled Social-Ecological Systems,” 291.
32. Kim, Miller, and Nowak, “Assessing Urban Vacant Land Ecosystem Services.”
33. Nowak et al., “Residential Building Energy Conservation and Avoided Power Plant Emissions by Urban and Community Trees in the United States.”
34. Kim, Miller, and Nowak, “Assessing Urban Vacant Land Ecosystem Services.”
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36. City of Somerville, "Somervision"
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47. Wynn Boston Harbor, “TEAM | WYNN FOR ALL.”

# 5 ACCESS

*"While one of the primary goals of the master plan is to create and improve trails along the length of the River, an equally important goal is to be able to connect surrounding neighborhoods to these trails."*
*- Mystic River Master Plan, 2009*

# INTRODUCTION

**Active transportation** is defined as any form of human-powered mobility – walking, cycling, using a wheelchair, in-line skating, or skateboarding. As opposed to recreation – movement for fun, exercise, and exploration – **active transportation is used to go places:** usually work, school, errands, or play.

Myriad studies have shown the societal and personal benefits of active transportation[1][2][3]. By building exercise into a daily routine, people who commute using their bodies have better health outcomes than those who drive or take public transportation. They also lower their individual transportation costs by not having to pay for gas, car registration/maintenance, or train and bus tickets. Active transportation is constructive for society because it reduces traffic congestion, greenhouse gas emissions, and public health crises.

2009 National Household Travel Survey data shows that of the 41% of U.S. trips that are three miles or less, 67% are driven, 27% are walked, and only 2.2% are biked[4]. But after more than a century of building car and truck-dominated streets, people across the country and the globe are beginning to understand its inherent unsustainability. Teenagers are waiting longer to get their driver's licenses[5], and of all the transportation methods, bicycling has seen the biggest increase in mode share in recent years – from 1.7 billion trips in 2001 to 4 billion trips in 2009[6].

## BETTER FOR THE BOTTOM LINE

Especially in cities seeking to attract and retain young professionals, active transportation networks are increasingly seen as crucial to local economic development and quality of life. Amazon's recent criteria for selecting the location of its second US headquarters provides a very clear example of this trend. In its request for proposals, the company asked competing cities: *"For each proposed site in your region, identify all transit options, including bike lanes and pedestrian access to the site(s). Also, list the ranking of traffic congestion for your community and/or region during peak commuting times[7]."*

Shopping and doing errands without a car generally means a smaller amount of cargo space – i.e. no trunk or back seat. But multiple studies have proven that while people who shop on foot or by bike spend less money per trip than their driving counterparts, they are more frequent shoppers and end up spending more money in local businesses[8]. In considering Metro Boston, this makes sense – large malls and commercial shopping centers such as Station Landing in Medford are usually surrounded by busy, high-speed roads. Alternatively, low speed, compact areas like Medford Square promote the patronage of small, local businesses.

*"I would love to see a way to get people off the path in the Medford Square. I see it as a business development opportunity, and the square revitalization plan does have a large focus in pulling the river into the square."*

~Alicia Hunt, Director of Energy and Environment, City of Medford

A panacea for many modern ills, active transportation for daily trips is beneficial for the environment, public health, and local economies. As a low-cost, zero-emission, calorie-burning transportation method, bicycling, walking, and rolling can help people achieve better health and wealth.

## THE STATE OF MYSTIC RIVER GREENWAY ACCESS

**Although still valuable as a recreational facility, a greenway system does not serve as an active transportation asset if people have to drive to get to it.** And although bus transportation is a frequently noted problem in Somerville and Medford, we have chosen not to address bus or train access to greenways in this report.

While MyRWA is focused on multi-year infrastructure projects to complete the path system along the river, its neighboring communities will not reap the benefits without considering how people can walk and bike to and across it. From densely populated squares to residential neighborhoods, this report seeks to illustrate how people living and working in Somerville and Medford access the Mystic Greenways by foot and bike – and why they don't.

Especially in an area ringed by highways and major arterials, we wanted to know where physical barriers to walking and biking to the Mystic currently exist, and how we might improve them in the near future.

I-93 Underpasses Along The Mystic River Create An Uncomfortable Pedestrian Environment. Photo: Liza Burkin.

## BARRIERS TO ACCESS

*"In some instances, residential neighborhoods are located close to the River and trail network, while in others, entire neighborhoods are essentially cut off from trail access by highways, busy side roads and commercial development."*

*~ Mystic River Master Plan, Mass DCR, 2009, pg. 47*

The Mystic River is surrounded on all sides by high-speed, multi-lane highways, arterials, and urban thoroughfares. I-93 hugs its southern banks while Route 16 (also called Mystic Valley Parkway) runs along the north. Route 28 (also known as the Fellsway) bisects Somerville and Medford, separating Ten Hills from Assembly Square and the Wellington neighborhood from other parts of Medford.

These roads cut off the Wellington MBTA station entirely, leaving it isolated on the river's edge. A little further out to the north and south respectively, Riverside Ave in Medford and Broadway in Somerville both run parallel to the river. While some stretches of Broadway have been treated with bicycle and pedestrian infrastructure, long sections of it remain immensely wide and completely unpainted – leaving bikers and walkers to fend for themselves among four lanes of traffic, and drivers to make their way through the chaos.

In Somerville, these roads divide the Mystic River from employment and population centers like Davis and Union Squares and Tufts University, as well as from lower-income communities like East Somerville, Magoun Square, and Winter Hill. In Medford, the Wellington neighborhood is cut off by the extremely difficult-to-navigate Wellington Circle. Torbert MacDonald State Park is unfortunately bordered by Route 16 to the north and the Fellsway to the east – almost necessitating driving to get there. For those who cannot drive like children, many seniors, some disabled people, and recent immigrants without drivers licenses, this

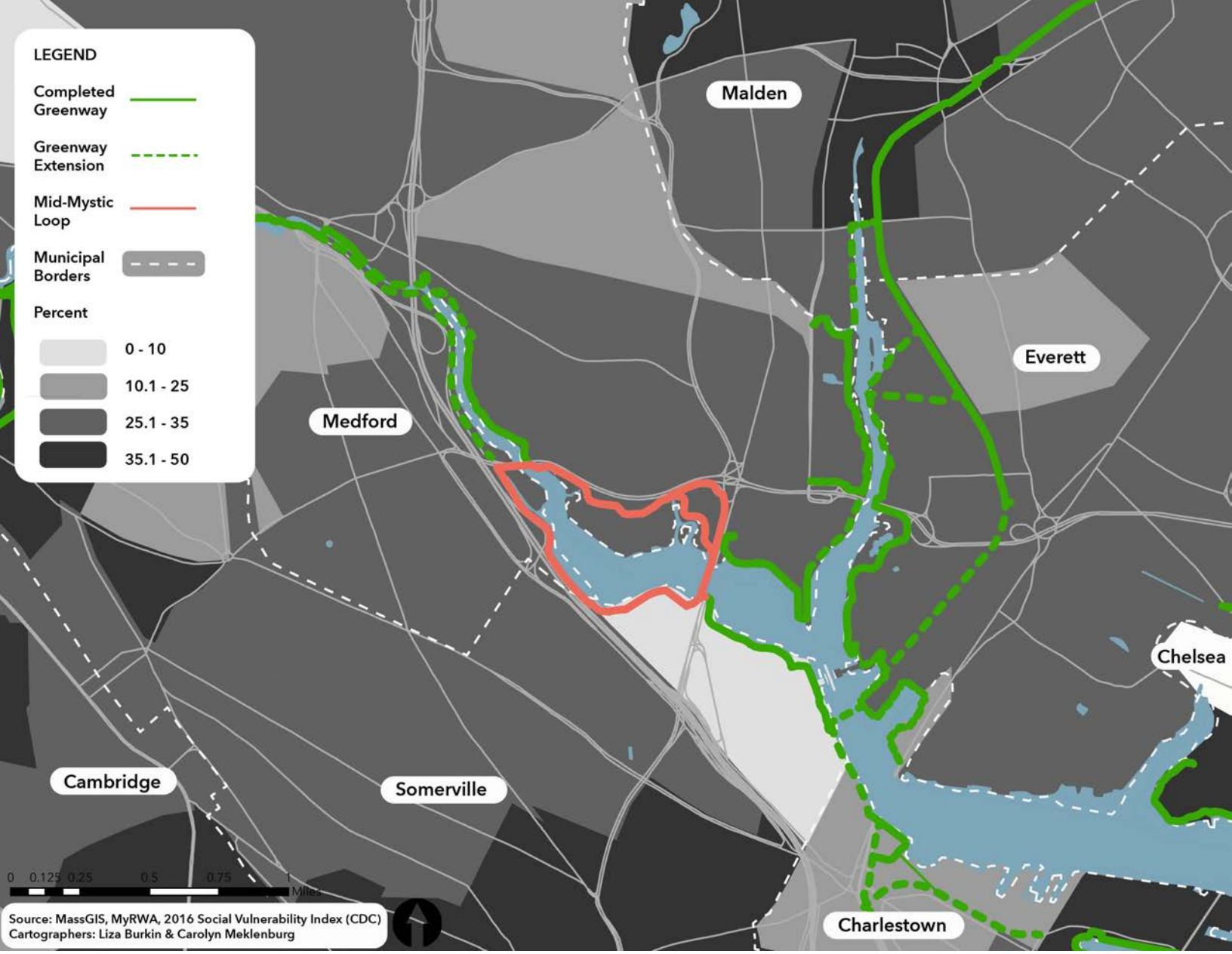



Figure 9. Percentage Of Population Without A Car By Census Tract.

park and the greenway that runs through it is essentially inaccessible.

The presence of high speed, high volume roads increases the necessity of owning a car for everyday travel. This causes nearby low-income households to bear the brunt not only of the resulting air and noise pollution, but also of the cost of owning and maintaining a car in an auto-dependent transportation system. The average annual operating cost of an average car is $8,220, where a bicycle is $308 – less than 4%[9]. For walking, it's the cost of a pair of shoes.

## EFFORTS UNDERWAY

*"Bicycle infrastructure does not exist in the Square today, but must be a part of the future street network."*
*~ Medford Square Master Plan, 2017*

Improving active transportation access to the Mystic River Greenways is a monumental task – a mountain that must be moved by a variety of local, state, and federal stakeholders. For example, I-93 is owned and operated by the United States Department of Transportation (USDOT); Route 16 and Route 28 by the Massachusetts DOT; and Broadway by the City of Somerville. Most of the parks themselves are

owned by the Massachusetts Department of Conservation & Recreation. Community organizations like MyRWA lead the way by advocating for this necessary change, and reaching across municipal and government boundaries to do so.

MyRWA has a number of partners in this vision. Local nonprofit advocacy groups including the Boston Cyclists Union, Livable Streets Alliance, WalkMedford, WalkBoston, Somerville Transportation Equity Partnership, and MassBike all have the mission of improving and encouraging walking and bicycling in these communities. Municipal committees like the Somerville Bicycle Committee and Medford Bicycle Advisory Commission are resident boards that work directly with city staff to plan and implement better bike networks. State and regional government agencies like MassDOT and MAPC work on large and long-range projects that will continue shifting the area's transportation system from auto-centric to multi-modal. Finally, private developers like the Wynn Casino (renamed Encore Boston Harbor at the time of this writing) are increasingly expected to provide public benefits in the communities in which they build.


A "Medford Scholars Route" Sign On Royal St. In Medford. Photo: Liza Burkin

One of the most relevant initiatives addressing access to the Mystic River to date is MAPC's Walking Routes to the Lower Mystic River project. Completed in 2014 and funded by Mass in Motion and the Mass Environmental Trust project, the agency developed a toolkit for local advocates and municipalities demonstrating how to advance branded, safe, and useful walking routes to the river. The project also identified and mapped many potential walking routes in Chelsea, Everett, Medford, and Somerville.

So far, three of these routes have been implemented:

1. Blueback Herring Route from Foss Park to Blessing of the Bay Park in Somerville
2. Medford Scholars Route from Tufts Park to Medford Square
3. Over the Mystic River Route, a loop starting and ending in Medford Square

*"Some of the benefits of walking routes to the river include:*

- *Higher visibility for the Mystic River and the recreational resources that do exist.*
- *Higher visibility means more people who care about the river and will advocate for it.*
- *Health and fitness benefits of promoting walking – less obesity, car pollution, decreased risk of disease.*
- *Potential economic benefits if routes help people walk by local businesses.*

*Programming around walking routes such as organized walks promote a sense of community."*

*~How to Develop Walking Routes to the Lower Mystic River and its Tributaries: A Tool Kit, MAPC, 2012*

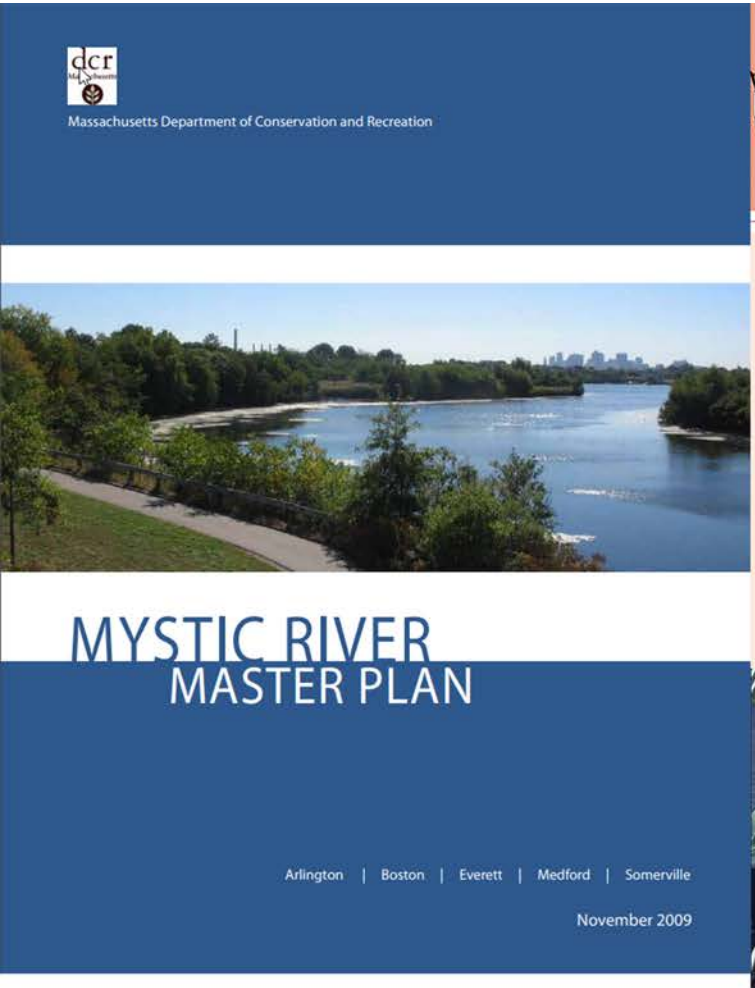
Following are just some of the past, current, and future plans that focus on increasing access to the Mystic River, and their specific recommendations. See table on next few pages.

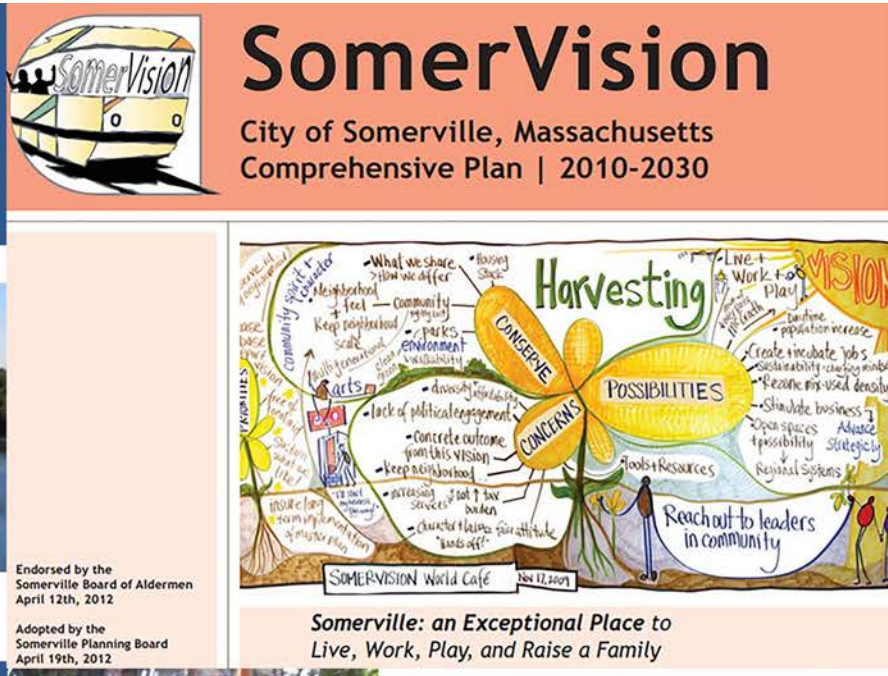
| Plan Details | How it Seeks to Improve Access to the Mystic River (text directly from plan) | What has been Implemented |
|---|---|---|
| **Mystic River Master Plan**<br><br>**Lead:** DCR<br><br>**Year:** Published November 2009<br><br>**More Information:** https://tinyurl.com/y767celx | The Mystic River Master Plan includes a focused section on access and recommends many improvements. These include:<br>• Improved street crossings and more clearly delineated pathways to the River at existing access points<br>• New access paths, including new crosswalks<br>• Signage and better delineation of pathways to the River from MBTA bus stops and stations for pedestrians and bicyclists<br>• Pathways to the River may be marked (painted or imprinted) with a symbol (such as footprints) that users come to associate with the Mystic River.<br><br>Specific locations and recommendations:<br><br>**Medford:**<br>• Hastings Lane: new signalized crossing<br>• Medford Square footbridge: trail marker and "footprints" ·<br>• Winthrop Street: signage, "footprints," and bike lane<br>• Winthrop Street: new crosswalk<br>• Mystic Avenue: pedestrian controls for the north and east crossings at the existing signal, bike lanes, "footprints" and trail markers<br>• West Street and Auburn Street: signage, "footprints" and bike lane<br>• West Medford MBTA commuter rail stop: new signage<br>• Harvard Avenue: signage, "footprints," and a striped, widened shoulder for bikes (Medford & Arlington)<br>• Boston Avenue: signage, footprints and a striped, widened parking lane for bikes (Medford & Arlington)<br>• Medford Square bus station: new signage<br>• Mystic Avenue: bike lane and signage improvements at the existing signalized crossing<br>• Mystic Valley Parkway exit: signalized pedestrian crossing, new multi-use pathway connector and "footprints", consider underpass at Mystic Valley Parkway<br>• Mystic Valley Parkway: signalized pedestrian crossing<br>• Harvard Street: footprints, crosswalks and pedestrian controls at the existing signal<br>• Marine Street: "Footprints", pedestrian control at the existing traffic signal, crosswalks<br>• Ship Avenue: sidewalk improvements and "footprints"; restrict parking to south side; new two-directional bike lane<br>• Locust Street: new signage and "footprints"; rebuild sidewalk and stripe shoulder for bike use<br>• Fellsway: add "footprints"<br>• Station Landing: add signage and "footprints"<br><br>**Somerville:**<br>• Shore Drive: improve lighting; add "footprints" and crosswalk west of signal<br>• Assembly Square: add trail through inactive MBTA railyard ·<br>• New pedestrian bridge adjacent to Amelia Earhart Dam | • Bike lanes painted on Boston Avenue (East) in Medford<br><br>• Craddock Bridge rehabilitation – Main Street in Medford Square. The reconstructed bridge will have four 11-foot wide travel lanes, 4-foot shoulders, one 11-foot sidewalk, one 7-foot sidewalk, and ornamental steel railing with the existing granite stone pilasters. Expected to be complete in Fall 2018. (Source: MassDOT)<br><br>• 25% design for a bicycle and pedestrian bridge crossing at Assembly Square has been completed by DCR, although an expected major funding contribution from the casino in Everett has yet to be confirmed.<br><br>• Missing link between Auburn and Winthrop St in Medford completed in 2017 (two shared-use paths, one paved, one stonedust).<br><br>• Another key missing link between Medford St and Riverbend Park - Clippership Connector - is underway. The project is being designed and will be shovel-ready by late 2018. |

| Plan Details | How it Seeks to Improve Access to the Mystic River (text directly from plan) | What has been Implemented |
|---|---|---|
| **Medford Square Master Plan**<br><br>**Lead:** MAPC, City of Medford<br><br>**Year:** Published September 2017<br><br>**More Information:** https://tinyurl.com/y73o4sr6 | Aims to "Enhance connections between the Mystic River, vibrant streets of Medford Square, surrounding neighborhoods, and regional open space networks."<br><br>Its #2 goal is to improve walking and biking in the Square, and its #4 goal is highlighting the Mystic as a central feature.<br><br>Specific recommendations:<br>• Completion of the "Clippership Connector" path<br>• A boardwalk connection that would occur on the north bank of the Mystic between the footbridge and Craddock Bridge.<br>• Sharrow markings and "share the road" signage is recommended for all primary streets in Medford Square including Salem St, Riverside Ave, Clippership Dr, City Hall Mall, River St, Forest St, Main St, Mystic Ave, High St, and Governors Ave.<br>• Alternative circulation patterns in Medford Square should be explored, studied, and analyzed for benefits that could improve traffic flow, convenience, and walkability in the Square.<br>• Mitigate highway infrastructure and elevated structures using approaches including circulation and safety, visual, and noise reduction.<br>• Reconfigurations of the Route 16 on and off ramps at Main Street could create additional parkland on the southern edge of the Mystic River.<br>• Strengthen pedestrian and bicycle circulation at the Salem Street rotary by additional yield signage or a rapid flashing beacon, as well as wayfinding and directional signage for pedestrians and bicycles.<br>• Improved lane markings for pedestrian crossings and traffic signals for the Route 16 on and off ramps connecting to Main Street and across Main Street itself.<br>• Redefine the central intersection at Salem Street, Riverside Avenue, Main Street, High Street, and Forest Street for walking:<br>• Change current traffic signal phases for better pedestrian experience.<br>• Improve the intersection geometry to reduce crossing distances for pedestrians and to slow traffic through the intersection.<br>• Reconsider travel directions and lane configurations. | • The Clippership Connector is underway – the project is being designed and will be shovel-ready by late 2018.<br><br>• Medford has recently completed High Street Route 60 Complete Streets projects including crosswalks with bumpouts and signs at Brooks School and West Medford Square, and reconfiguration of the Winthrop Street rotary, with crosswalks and median island striping (but not raised medians).<br><br>• Medford enacted a citywide 25 mph speed limit except in a few places where 30 mph is posted.<br><br>• Winthrop Rotary has been recently upgraded with Complete Streets improvements |
| **Somervision**<br><br>**Lead:** City of Somerville<br><br>**Year:** Adopted by the Somerville Planning Board April 19th, 2012<br><br>**More Information:** https://tinyurl.com/ybznr2qo | Relevant Somervision goals and policies include:<br>• 50% of New Trips via Transit, Bike, or Walking as part of an equitable plan for access and circulation to and through the City.<br>• The City should ensure that every transportation project results in improved pedestrian access<br>• The City should improve on-street bike infrastructure, prioritizing bike lanes over sharrows.<br>• Connect the city: retrofit, redesign, and build, as necessary, roads, bridges, paths and rights-of-ways to improve transportation networks and link neighborhoods and commercial centers within Somerville and beyond. | • Lowered speed limits: as of Monday, November 7, 2016, the new speed limit throughout the city is 25 mph unless otherwise posted. |

| Plan Details | How it Seeks to Improve Access to the Mystic River (text directly from plan) | What has been Implemented |
|---|---|---|
| **Somervision (cont.)**<br><br>**Lead:** City of Somerville<br><br>**Year:** Adopted by the Somerville Planning Board April 19th, 2012<br><br>**More Information:** https://tinyurl.com/ybznr2qo | • The City should advocate for infrastructure projects that mitigate the adverse impacts of highway infrastructure, with particular attention to providing greater access and connectivity to pedestrians and bicyclists and addressing health and quality of life impacts experienced by abutters.<br><br>Specific action items:<br>• Advocate for the passage of a 25-mph speed limit as the given, unmarked, speed limit on all city streets, lowering it from the current 30 mph speed limit.<br>• Create an additional access point under Interstate 93 to better connect East Somerville with Assembly Square.<br>• Install sidewalks along Mystic Avenue near the McGrath Highway / Interstate 93 intersection, and ensure crosswalks reflect how pedestrians use the area, particularly to and from Foss Park.<br>• Work with the Commonwealth to improve pedestrian and bicycle connections across and along Route 16/Alewife Brook Parkway/Mystic Valley Parkway.<br>• Improve the connections over and access along Mystic Avenue/Route 38, providing greater comfort and access to pedestrians and bicyclists, and safer conditions for vehicles.<br>• Investigate taking control of the Somerville portions of Route 28, Route 16, and Mystic Avenue. Urge MassDOT and USDOT to fully mitigate the impact of Interstate 93, including air and noise pollution.<br>• Encourage the City of Boston and MassDOT to improve the conditions between Broadway in East Somerville and Sullivan Square, providing adequate lighting and safety standards for the Somerville residents using the MBTA Station at Sullivan Square.<br>• Improve existing crossings under Interstate 93 to address pedestrian and bicycle safety and enhance the attractiveness of areas including the Kensington Underpass, Lombardi Street, McGrath Highway, and Wheatland Street.<br>• Advocate for completion of the Alewife Brook and Mystic River path network in coordination with the state's Mystic River Master Plan, with projects including:<br>  • A boardwalk under Wellington Bridge/Route 28<br>  • Building a public path over or parallel to the Amelia Earhart Dam to connect Assembly Square with Everett/Boston<br>  • Extending the path that currently ends at Draw 7 Park to Everett and Charlestown. | • HAWK signal installed at Kensington Underpass for better pedestrian safety, being considered for infraspace improvements by MassDOT.<br><br>• In 2018 Somerville became a Gold Level Bicycle Friendly Community – protected bike lanes and cycle tracks being implemented around the City, although none near the Mystic River. |
| **Wynn for All**<br><br>**Lead:** Wynn (Encore) Boston Harbor<br><br>**Year:** 2018<br><br>**More Information:** www.wynnforall.com | As part of the Everett casino's community benefits agreement, the developers agreed to spend $58 million on road and traffic improvements, with the most significant work occurring along a one-mile stretch within the Lower Mystic River Watershed Area. They are calling it the "Mystic Mile." Most of the road work will go towards improving the following intersections:<br>• Sullivan Square, Boston<br>• Santilli Circle, Everett<br>• Sweetser Circle, Everett<br>• Wellington Circle, Medford<br>• Rt. 99 / Broadway, Everett | Road work construction began in summer 2017 and is currently ongoing; will be completed in 2019. At the time of this report, crews are working in the following places:<br>• Sullivan Square<br>• Route 16<br>• Alford Street/ Broadway (Route 99)<br>• Wellington Circle |

| Plan Details | How it Seeks to Improve Access to the Mystic River (text directly from plan) | What has been Implemented |
|---|---|---|
| **The Lower Mystic River Corridor Strategy**<br><br>**Lead:** BRA, MAPC<br><br>**Year:** Published in June 2009<br><br>**More Information:** https://tinyurl.com/ychjpqvy | Strategy #3 of this plan is: Improve Access to and Along the River through the Development of Water Transportation, Public Transit, Roadway Improvements, and Bicycle and Pedestrian Accommodations<br><br>Top relevant priority projects:<br>• Winthrop Street Bridge Replacement: widen bridge for more space for bicyclists and pedestrians<br>• Craddock Bridge Replacement<br>• Route 16- Revere Beach Parkway: Wellington Circle will be replaced with a tight single-point diamond interchange, under which the four-lane section of Route 16 would pass.<br>• I-93/Mystic Avenue Interchange: construct a new underpass grade separating Route 28 northbound and convert the existing underpass to the exclusive use of Route 28 southbound. In addition, a new connector road will be constructed between Mystic Avenue and Middlesex Avenue and the Interstate 93 northbound off-ramp will be reconstructed to permit the connector road to have access to the Assembly Square Mall area.<br>• Clippership Drive Realignment: implement traffic calming for better pedestrian safety, especially near a senior housing complex | • Craddock Bridge currently being replaced |
| **Healey+Mystic Master Plan**<br><br>**Lead:** Friends of Healey<br><br>**Year:** Published March 2017<br><br>**More Information:** healeymystic.org | • Extend Memorial Road northeast to Connors Drive as a new linear pedestrian street. The street provides a car-free, central gathering area for the Mystic community and establishes a clear and direct pedestrian route through the Mystic Neighborhood, between the Healey School and the River.<br>• Renovate the Park to welcome people to enjoy activities along the river's edge and/or safely connect to the larger Mystic River Reservation Bike Trail. Site improvements could include:<br>  • Improved pedestrian walkway along Shore Drive<br>  • Bike/pedestrian trail along the river's edge<br>  • Opportunities for interactive programming.<br>• Improve the pedestrian experience at Mystic Avenue's Shore Drive crossing. Improvements may include:<br>  • Widening the sidewalk pavement at the intersection<br>  • Adding a crosswalk at the northwest crossing<br>  • Increasing signal length<br>  • Adding bike lanes along both streets<br>  • Improving lighting, particularly underneath the elevated portions of I-93. | • Blessing of the Bay Park Redesign is underway – 25% schematic design by summer 2018. |





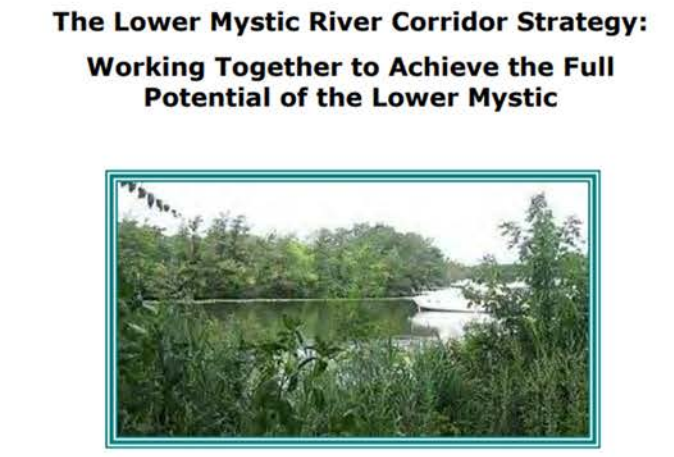







Figure 10. Municipal And Regional Plans That Improve Access To The Mystic River

# LOCAL DESTINATIONS AND ROUTE AUDITS

With the guidance of our client and by reviewing MAPC's Walking Routes project, our team identified 12 local destinations – academic, transit, commercial, community, and employment centers – from which to prioritize safe access to and across the Mid Mystic Loop. We then set out to walk and bike these routes that lead to three parks along the loop: Blessing of the Bay and Sylvester Baxter Riverfront Park on the Somerville side, and Torbert Macdonald State Park on the Medford side. These routes were tested both by walking and cycling, and audits of existing conditions were conducted using the following checklist provided by MAPC.

| Route | Mode | Distance | Time |
|---|---|---|---|
| 1. Tufts University to Blessing of the Bay | Cycling | 2.2 miles | 13 minutes |
| 2. East Somerville to Baxter Park | Walking | 0.8 miles | 16 minutes |
| 3. Station Landing (Wellington Station) to Torbert MacDonald Park | Walking | 0.6 miles | 13 minutes |
| 4. Magoun Square to Blessing of the Bay | Walking | 1.2 miles | 22 minutes |
| 5. Union Square to Blessing of the Bay | Cycling | 1.7 miles | 13 minutes |
| 6. Davis Square to Blessing of the Bay | Cycling | 2.4 miles | 15 minutes |
| 7. Bunker Hill Monument to Baxter Park | Walking | 2 miles | 42 minutes |
| 8. Medford High School to Medford Square | Walking | 1 mile | 20 minutes |
| 9. Fermentation District to Torbert Macdonald Park | Walking | 1.6 miles | 34 minutes |

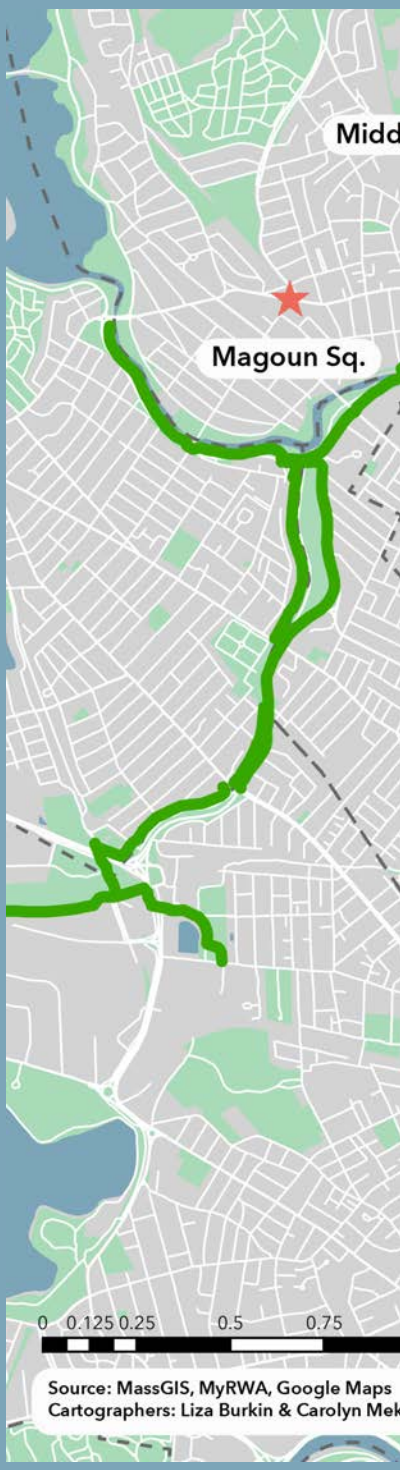
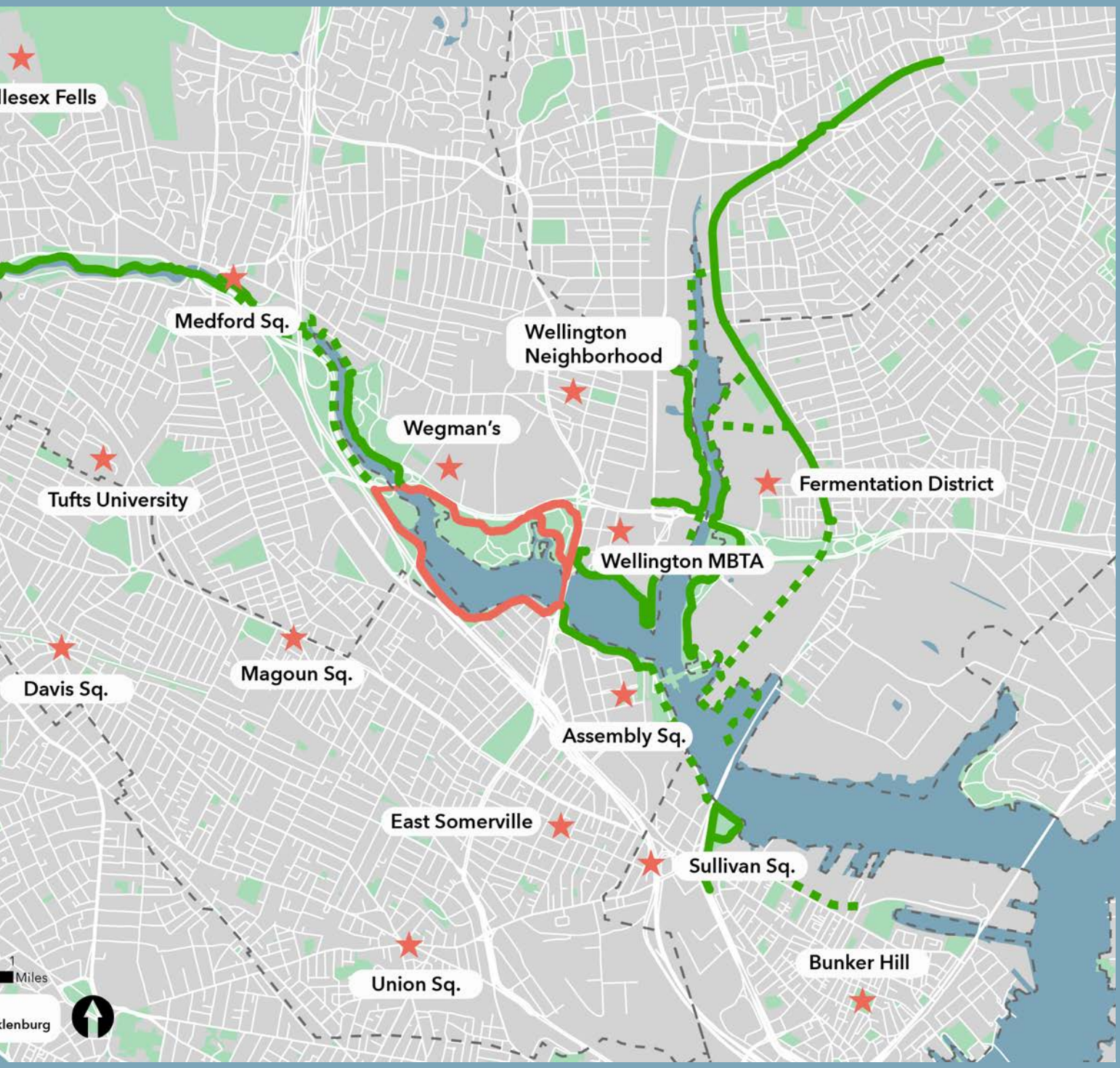



Figure 11. Route Audit Chart And Local Destinations Map.


llesex Fells
Medford Sq.
Wellington Neighborhood
Wegman's
Tufts University
Fermentation District
Wellington MBTA
Magoun Sq.
Davis Sq.
Assembly Sq.
East Somerville
Sullivan Sq.
Union Sq.
Bunker Hill
1
Miles
klenburg

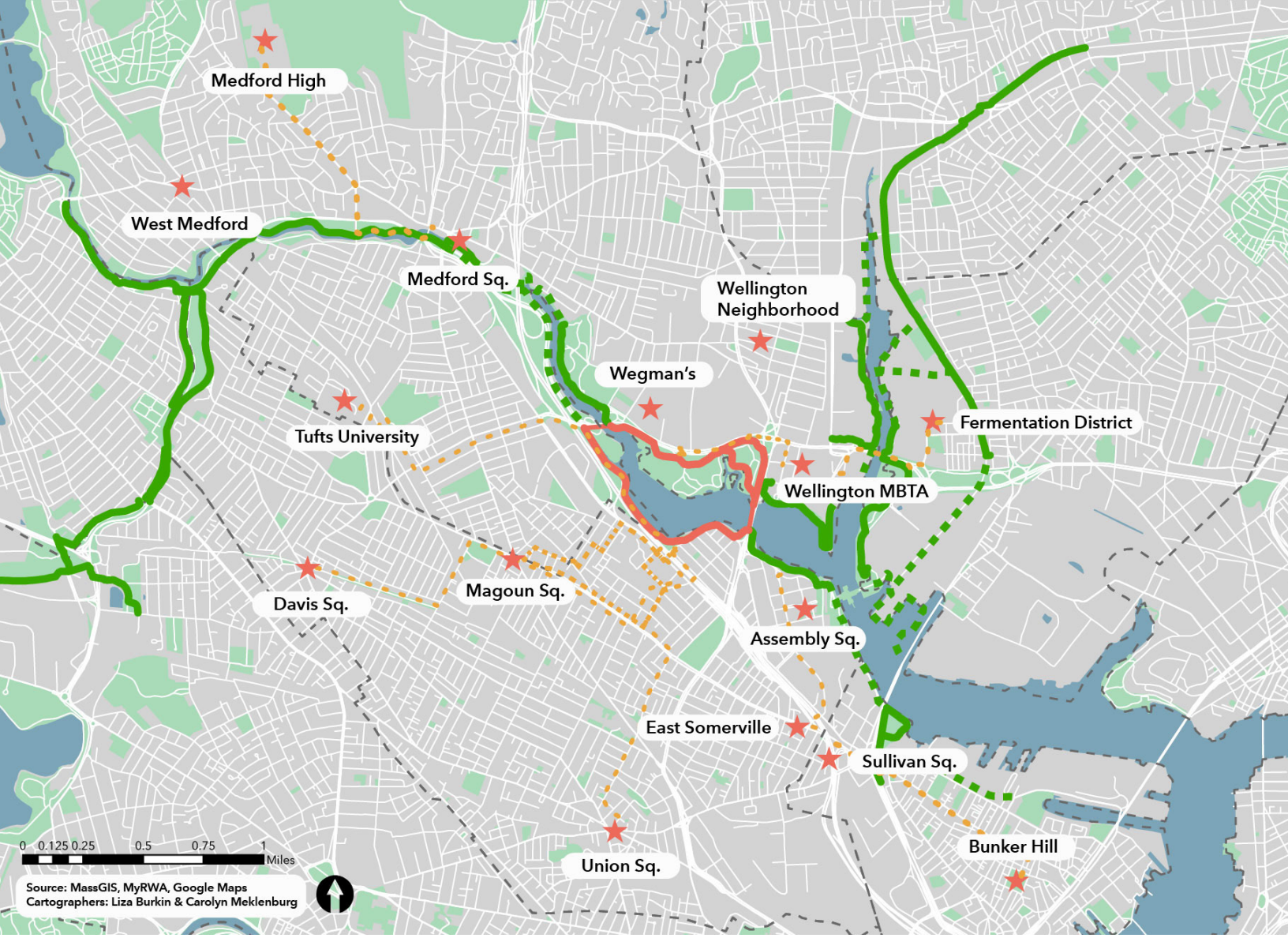
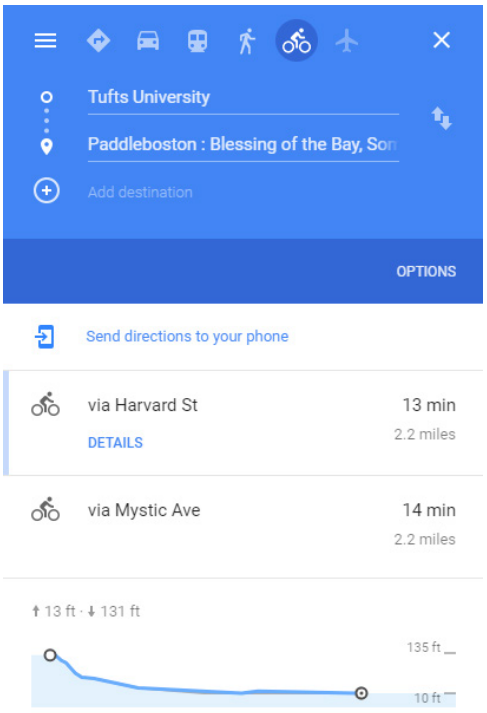



Figure 12. Route Audits Map.

## GOOGLE MAPS VS. MAPC

MAPC's identified potential walking routes were designed to be safe and comfortable for pedestrians. While these may be useful for recreation and for those who know the neighborhoods intimately, for many people, Google maps is the dominant navigation tool of choice.

Google typically provides the most direct route from A to B, making it likely to be used for active transportation and everyday commuting. We decided that when possible, we would compare and contrast the MAPC route to the Google route to observe the tension between comfort and speed.




Google Maps Is A Dominant Navigation Tool For Pedestrians And Bicyclists Because It Specifies Directions By Mode Of Transportation.

## METHODS:

### WALKABILITY AND BIKABILITY CHECKLIST

The following checklist used to analyze the Mystic access routes is based on one prepared by MAPC and modified with additional questions to include cycling:

| | SIDEWALKS AND BIKE LANES | NUMBER OF ROUTES |
|---|---|---|
| 1. | Streets containing one sidewalk at any given point | 1, 2, 3, 4, 5, 6, 7, 8, 9 |
| 2. | Blocked by poles, signs, shrubbery, dumpsters, news boxes, or other obstructions | 2, 3, 4, 9 |
| 3. | Too narrow at any given point | 4, 7, 8, 9 |
| 4. | Too wide without effective usage of space at any given point (i.e bike lanes, street trees, outdoor seating) | None |
| 5. | Lack of bicycle lanes on wide streets | 1, 3, 5, 6 |
| 6. | Shoulder or bicycle lane blocked by obstruction (shrubbery, dumpsters, snow) | 1, 5 |
| *Locations of any problems:*<br>*(see problem chart and map)* | | |
| | **STREET CROSSINGS** | **NUMBER OF ROUTES** |
| 1. | Too wide at any given point | 1, 3, 4, 5, 6, 7, 8, 9 |
| 2. | Intersections with no traffic signals | 3, 8 |
| 3. | Wait time for crossing too long | 3, 8, 9 |
| 4. | Signals with not enough crossing time | 4, 7, 9 |
| 5. | Obstructions (cars, trees, shrubbery, signage) blocking view of traffic | 7 |
| 6. | Broken, obstructed, or lack of curb ramps | 3, 9 |
| 7. | Lack of crosswalks at major crossings | 2, 5, 7 |
| 8. | Street curvature or hill made traffic difficult to see | 5, 8, 9 |
| 9. | Lack of bicycle infrastructure at wide crossings | 1, 5, 6, 7, 9 |
| *Locations of any problems:*<br>*(see problem chart and map)* | | |
| | **MISCELLANEOUS** | **NUMBER OF ROUTES** |
| 1. | Areas that are noisy, stuffy, smelly | 1, 2, 3, 4, 7 |
| 2. | Lack of signage | 1, 2, 7, 8, 9 |

Figure 13. Walkability And Bikability Checklist.

# ROUTE AUDITS

## 1. TUFTS UNIVERSITY TO BLESSING OF THE BAY

This crucial route connects a major anchor institution – Tufts University – to the existing Mystic River Greenway, which is less than a mile away as the crow flies. Biking to Blessing of the Bay Park to relax or rent a boat from PaddleBoston, however, is 2.2 miles away. While the distance is short, the level of traffic stress is high near the river. MAPC did not provide a preferred route from Tufts to Blessing of the Bay, the route was followed using Google Maps.

While mixing with motor traffic, the beginning of the route would be considered comfortable for most existing bicyclists. Both Boston Ave and Harvard Street in Medford are two-lane, two-way streets with relatively low-speed traffic. Boston Ave has "sharrows" – shared lane markings – while Harvard Street does not. Bicyclists must "take the lane" on these narrow streets, as there is no room for cars to safely pass.

Harvard Street In Medford Is A Quiet Two-Lane Road At The Beginning Of The Route.

Harvard Street Turns Into Route 16 And Bicycling Becomes Much Less Comfortable.

The real issue with this route begins at the intersection of Harvard Street and Mystic Ave, where a narrow urban street abruptly shifts to highway conditions. Pedestrian crossings are extremely long and exposed, and no bicycle infrastructure is present despite wide travel lanes. Installing shorter, more visible crosswalks and pedestrian signals – as well as bike boxes and painted bike lanes – would drastically improve this intersection for active transportation.

The second major crossing is on Route 16 under I-93. While there is a shoulder present, snow currently covers half it, putting bicyclists even closer to high-speed traffic. The shoulder widens in the underpass, and could be converted into an actual buffered bike lane.

Just beyond I-93 is the entrance to the Greenway itself. Without any signage to indicate the ingress, it was easy to bike right past it, necessitating a U-turn on Route 16. A recognizable gateway here would help increase visibility for the Greenway, and also alert drivers to the fact that higher numbers of pedestrians and bicyclists are present. The rest of the ride to Blessing of the Bay Park is on the existing path – which while noisy, is safe and comfortable for bicyclists of all ages and abilities.

## 2. EAST SOMERVILLE TO BAXTER PARK

This route connects the densely populated residential neighborhood of East Somerville to the recently created Baxter Park in Assembly Square. On the way to Baxter Park, the route that was outlined by MAPC as being best for bikers and pedestrians was followed. On the way back, Google Maps' suggested route was taken to determine if there was a difference in comfort levels and which was preferable.

**MAPC:** The route provided by MAPC was very pleasant – sidewalks were well-maintained and had street lights for walking in the dark. Overall though, increased signage would have helped, as the route to the river is not marked.

**Google Maps:** This route overall was mostly pleasant as well. The sidewalks were new and the area was well-lit. However, occasionally the sidewalk was only available on one side of the road. In some places lamp posts and parking meters are placed in the middle of the sidewalk, blocking passage for people in wheelchairs.

**MAPC and Google Maps:** The worst intersection is located at Mystic Ave and Grand Union Boulevard. After crossing through the I-93 underpass, there is a walk sign but no crosswalk. Mystic Avenue is a busy arterial and even when pedestrians have the right-of-way, cars going right on red fail to let them cross. Once able to cross, many of the cars were observed to stop where a crosswalk should have been, necessitating walking around them.

**Conclusion:** Overall, MAPC's route was more enjoyable, as there were no traffic lights to wait at and the route was continuous. However, Google Maps' route was not altogether uncomfortable, but it has problematic spots for people with specific accessibility needs as well as a dangerous intersection.

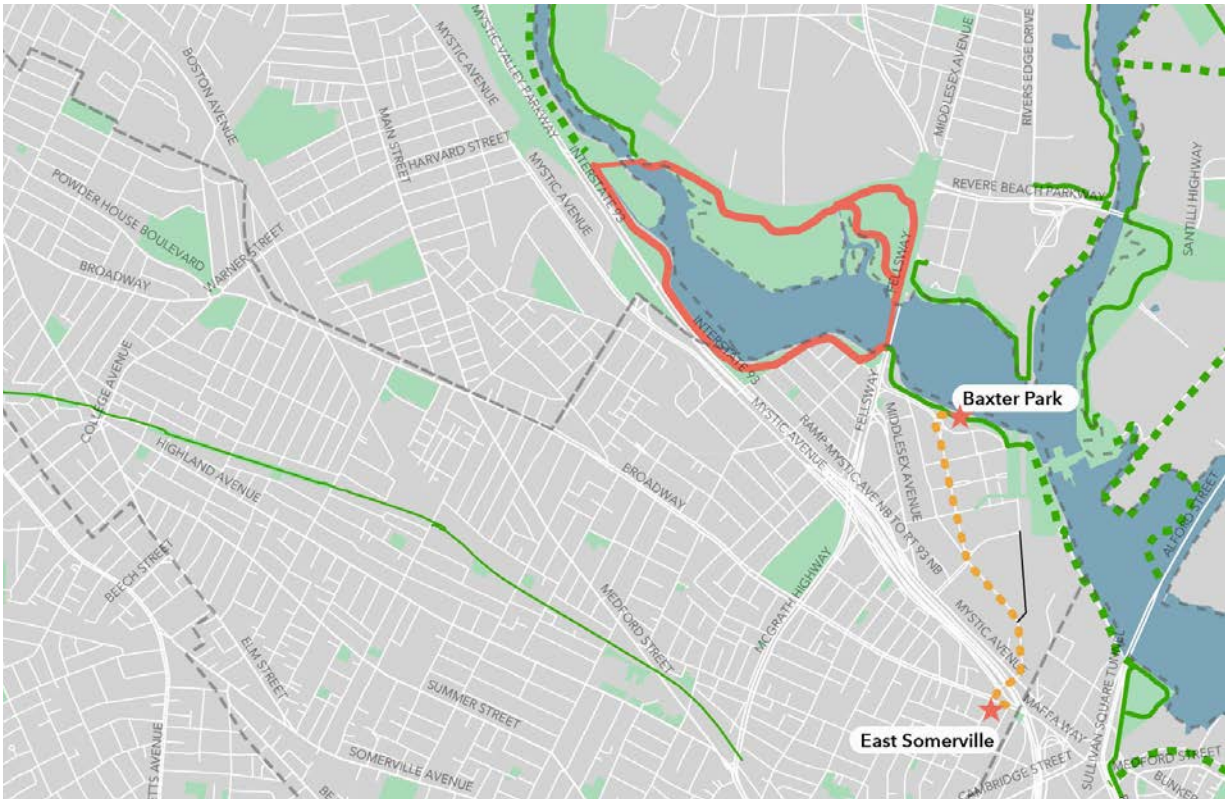



Figure 14: East Somerville To Baxter Park Route Map.

## 3. STATION LANDING TO TORBERT MACDONALD PARK

**Description:** The purpose of this route is to connect people to Macdonald Park on the Mystic River from two points – the Wellington T Station on the Orange Line, and Station Landing, the mixed-use development of retail, dining, and residences. Albeit less than half a mile, the route crosses one of the busiest intersections in the area – Wellington Circle – one of the most challenging for pedestrians and bicyclists.

**Problem Spots:** The intersection of the Fellsway (Route 28) and the Mystic Valley Parkway (Route 16) – locally known as Wellington Circle – represents a major problem spot for active transportation access to the Mystic River. While there are traffic lights stationed at the pedestrian island there are no walk signals for pedestrians. Though pedestrians are free to cross when traffic flowing southbound has the green light, they must use their judgement in order to know when to cross. In this particular intersection, automatic walk signals would be crucial in reassuring pedestrians that they are in fact safe to cross the street.
They also serve as time indicators because without signals, pedestrians have no knowledge of when the traffic will stop and vehicles from other directions will begin. Signal cycles are currently extremely long, forcing pedestrians to wait for a minute or more at the light.

Aerial View Of Wellington Circle

Snow Removal Failure By Station Landing

Another problem spot is located on the westbound direction of Route 16, heading from Station Landing toward Macdonald Park. The crosswalk links the pedestrian island that straddles the Fellsway to the sidewalk that leads directly to the park. It had snowed a few days prior, and maintenance workers had failed to clean up this bank of snow that ultimately barring pedestrians from accessing the crosswalk. Walkers are forced around the island to cross at an unmarked location. Furthermore, it is evident that there is no walk signal, so pedestrians are again forced to use their judgment to decide when it is safe to cross.

*See the rest of the route audit descriptions in Appendix E.*

# COMMUNITY ENGAGEMENT

## SURVEY FINDINGS

*"Harvard street at Mystic Valley Parkway is pretty terrifying (biking from the Tufts area to the River) to make my way over to the bike path. Biking across the many lanes of traffic heading to I-93 and traveling under the underpass without a bike lane is scary as cars drive fast and there is often debris on the side of the road"*

*~ Female Somerville resident*

Of our 212 online and in-person survey respondents, 51.23% live within one mile of the river and another 30% live between one and three miles from the river. Only 36.45% are primarily car drivers – the rest are split between biking, public transportation, walking, and some combination of modes.

One of most important questions we had for our survey takers was *'what are the streets, intersections, or other barriers that make it hard for you to bike to, along, or across the Mystic River?'*

Of the 105 responses for this particular question, we received the results in Figure 16 at right.

| Intersections | # of responses |
|---|---|
| Medford Sq, Main St./Mystic Ave, 93/38, High St. | 23 |
| Route 28/16, Wellington Circle, Fellsway/McGrath | 18 |
| Harvard St. & Mystic Ave / Underpass / 38 | 8 |
| Temple St. & Mystic Ave. | 5 |
| Washington & McGrath, Kensington Underpass | 4 |
| Mystic Valley & Auburn St. / Boston Ave | 3 |
| 16 & 99 | 3 |
| Boston Ave & Mystic Valley Pkway / Winthrop St. | 2 |
| Sullivan Sq | 2 |
| Mystic Valley & Locust St. | 2 |
| Powderhouse Sq | 1 |
| | |
| **Streets** | |
| Mystic Valley Parkway / Route 16 | 21 |
| Mystic Ave | 14 |
| Route 28 / McGrath Highway / Fellsway | 12 |
| Main St. | 8 |
| Winthrop St. | 6 |
| Route 38 / Mystic Ave | 6 |
| Alford St. / Lower Broadway / Route 99 | 6 |
| High St. | 5 |
| Riverside Ave | 4 |
| Shore Drive | 2 |
| Alewife Brook Pkway | 1 |

Figure 16. Ranking Of Worst Intersection And Streets.

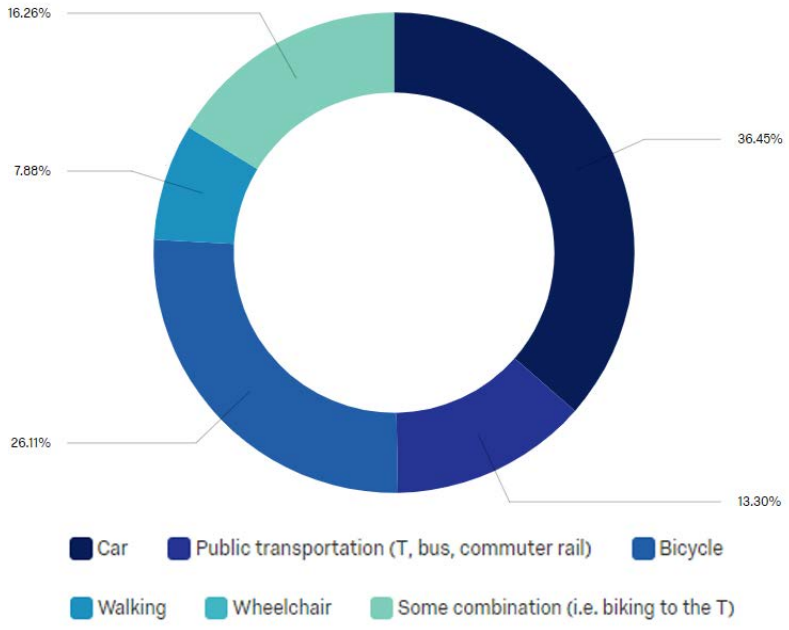



Figure 15. Primary Mode Of Transportation By Percent.

# CROWDSOURCED PROBLEM SPOTS MAP

In addition to a regular survey, we wanted to offer a visual, map-based option for people to report their issues with Mystic River access. We decided to employ Esri's Crowdsource Map tool, which allows users to upload geo-located photographs and descriptions using their smartphones. While this obviously excludes non-smartphone users, we wanted to experiment with this data collection technique.

Reviewing this map shows us "hotspots" of areas where many issues have been uploaded. While not all submissions have useful content for identifying problem spots, it is interesting to experience the built environment through the eyes of the map users.

This is really wide and also needs more paint
RT-16 E, Everett, Massachusetts, 02149

The crosswalk light here is super long and it's a wide intersection and it needs new paint

Figure 17. Example Of A Problem Spot Mobile Submission

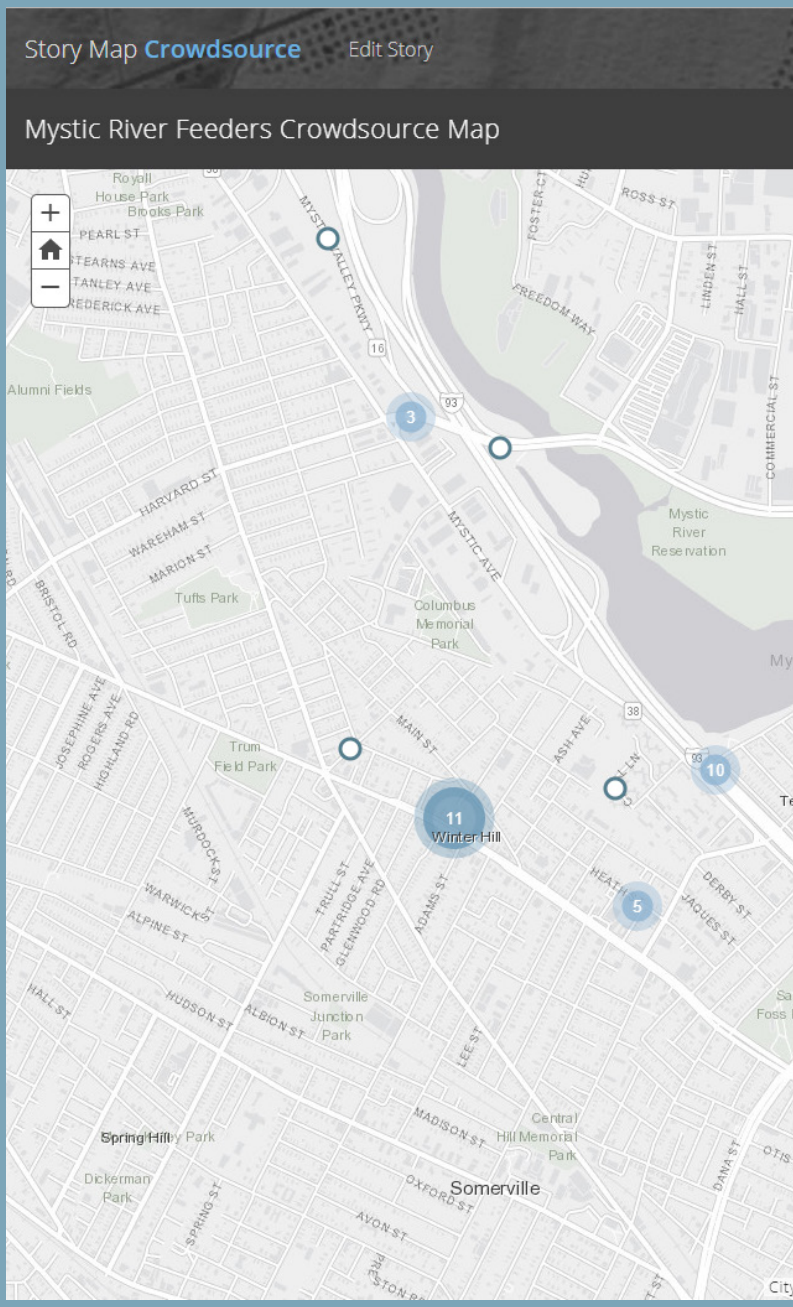
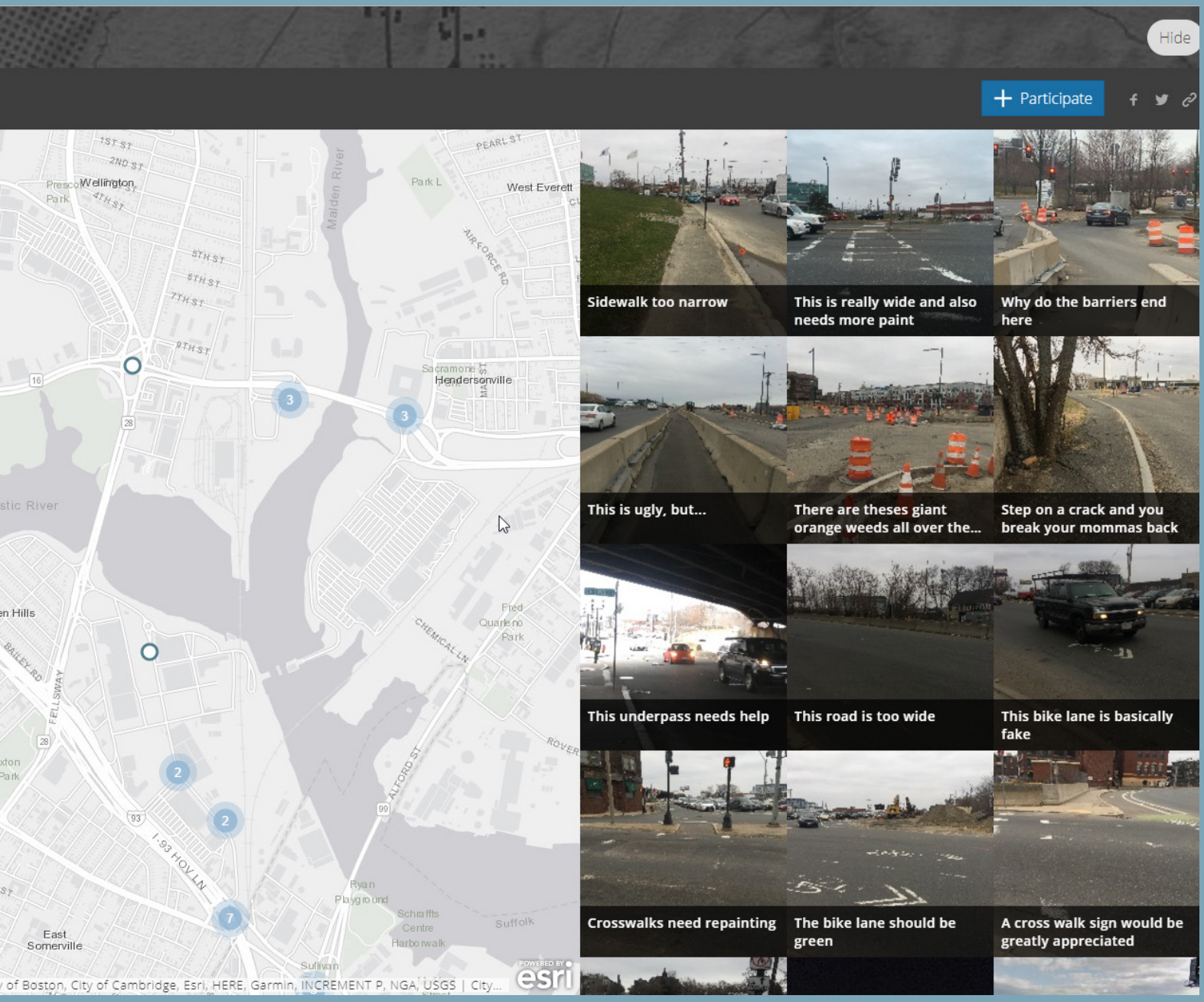



Figure 18. Crowdsourced Problem Spot Map


Hide
Participate
Wellington
West Everett
Malden River
Park L
Sacramone Henderssonville
Fred Quarleno Park
Ryan Playground
Schraffts Centre Harborwalk
East Somerville
Suffolk
Sullivan
Sidewalk too narrow
This is really wide and also needs more paint
Why do the barriers end here
This is ugly, but...
There are theses giant orange weeds all over the...
Step on a crack and you break your mommas back
This underpass needs help
This road is too wide
This bike lane is basically fake
Crosswalks need repainting
The bike lane should be green
A cross walk sign would be greatly appreciated
esri

# OPPORTUNITIES FOR IMPROVED ACCESS

*"There are many instances where the pathway system will intersect with side streets and major roadways. Access points at these crossings should be clearly marked as entrances to the Reservation and trail system. Large granite posts are proposed to mark entrances. All intersections should be clearly marked with striped crosswalks and pedestrian-activated signals where possible. "Yield to pedestrians" signs should be added in both directions where the signals are not feasible. Many of the crosswalk and signal recommendations will have to be carried out by the municipalities in which they are located."*

*~ Mystic River Master Plan, DCR, 2009, pg 41.*

## TOP TEN PROBLEM SPOTS

Using a combination of our survey results, route audits, previous plan analysis, and problem spots map, we identified 10 priority intersections to improve walking and biking access to the Mystic. In no particular order, they are:

## HARVARD ST AT MYSTIC AVE AND ROUTE 16 AT I-93

Problems: long and faded crosswalks, no bike markings, long signal phases, narrow sidewalks, high speeds, high traffic volume.


## WINTHROP ROTARY

(recently under construction)

Problems: no bike markings, faded crosswalks, narrow sidewalks.


## TEMPLE STREET AT MYSTIC AVE

Problems: missing and faded crosswalks, no bike infrastructure, dark and uninviting underpass, long signals, high traffic speed and volume.


## WELLINGTON CIRCLE

Problems: missing, faded, long, and inadequately visible crosswalks, very long signal phases, no bike infrastructure, high traffic volume and speed.

## MAIN STREET AT MYSTIC AVE

(currently under construction)

Problems: only sharrows (shared lane markings) for bikes.

## KENSINGTON UNDERPASS AT MYSTIC AVE

(currently funded for improvements)

Problems: dark, dingy, uninviting underpass.


## SHORE DRIVE AT MYSTIC AVE

Problems: faded and inadequately visible crosswalks, no bike markings, dark underpass.

## GRAND UNION BOULEVARD AT MYSTIC AVE

Problems: very wide crossings with faded and missing crosswalks, no bike infrastructure.

## SULLIVAN SQUARE

(currently under construction)

Problems: chaotic pedestrian and bicycle environment with high speeds and volumes, missing and faded crosswalks, no bike infrastructure.

## SANTILLI CIRCLE

(currently under construction)

Problems: chaotic pedestrian and bicycle environment with high speeds and volumes, missing and faded crosswalks, no bike infrastructure.

## SOLUTIONS

*"Changing the transportation paradigm to transit and biking and walking is ultimately what we need. Linking all the regional paths is for us the most important thing, because that will change the paradigm the most."*

*– Wig Zamore, Community Organizer, CAFEH, Somerville Transportation Equity Partnership (STEP) & Mystic View Task Force*

In our final chapter on holistic solutions we will present ideas, best practices, and cost estimates for specific ways in which the problem intersections and corridors can be improved – including protected bike lanes, curb extensions, raised crosswalks, pedestrian overpasses and more (page 81).

Endnotes


1. Rojas-Rueda, D., et. al. "The health risks and benefits of cycling in urban environments compared with car use: health impact assessment study."
2. Rashad, Inas. "Cycling: An Increasingly Untouched Source of Physical and Mental Health
3. Copenhagen City of Cyclists. "Copenhagen City of Cyclists: Bicycle Account 2014"
4. Litman, Todd. "Short and Sweet: Analysis of Shorter Trips Using National Personal Travel Survey Data."
5. Shults, Ruth A. PhD, et. Al. « Driving Among High School Students – United States, 2013. »
6. USDOT. "The National Bicycling and Walking Study: 15-Year Status Report."
7. Amazon. "HQ2 RFP"
8. Clifton, Kelly et. al. "Examining consumer behavior and travel choices
9. Mohn, Tanya. "Pedaling to Prosperity: Biking Saves U.S. Riders Billions A Year."


# 6 HEALTH

*"I feel like these development decisions, whether it's housing or parks or active transportation are made without factoring in the air pollution. So I want air pollution to be on the list..."*

-Doug Brugge, CAFEH Director

# HEALTH IN THE MYSTIC RIVER WATERSHED

## CHRONIC HEALTH VS. SAFETY

*People always focus on accidents, but the amount of people killed him who die early from air pollution exposure among cyclists is actually higher than people who die from accidents. But people are not scared by chronic things, they're scared by violent things. But the chronic just vastly outweighs it.*

*~ Wig Zamore, Community Organizer, CAFEH, Somerville Transportation Equity Partnership (STEP) & MysticView Task Force*

In this chapter we will be discussing factors that affect chronic health issues due to near-highway pollution, rather than vulnerable road user safety. While safety is a critical component to health, and a vital topic when discussing active transportation around the Mystic River Greenways, we found that a number of municipal and regional plans had already addressed this topic. Conversely, from our research we noticed many plans failed to discuss mitigation of the cardiovascular, respiratory, and cognitive risks of living and exercising near high-traffic roadways. Due to limited time, we chose to focus on chronic health, and more specifically dive into air and noise pollution caused by I-93.

## WHO THE GREENWAYS SERVE

The Mystic River Greenways are versatile spaces that cater to a variety of needs and people. For residents that elect for active transportation, the greenways act as a connector, allowing cyclists, pedestrians, and other users the opportunity to safely commute across and along the river. Additionally, the greenways provide visitors with a place of respite and a spot to connect back to nature through recreational open space. The greenways are not just a place to walk the dog, launch a boat, bird-watch, take a run or cross the Mystic River; they are

all those things at once, and one of the only places in the area to do so.

The people who primarily use the space are those that live nearby and/or can easily access the space. There is high neighborhood diversity in close proximity to the Mystic. Some neighborhoods, like Assembly Row, are tailored to wealthier individuals that can afford to live in new luxury housing with a variety of amenities at their fingertips. Comparatively, the river also serves individuals on government food assistance programs like SNAP (Supplemental Nutrition Assistance Program) and those with no vehicle. This amalgam of socioeconomic status leads to a number of challenges and opportunities for the greenway. Most importantly, the Mystic River Greenways serve groups that have traditionally been left out of the decision-making process for their communities.

## ENVIRONMENTAL JUSTICE

## COMMUNITIES

Environmental justice, as defined by the Environmental Protection Agency (EPA), is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies[1]. When all communities can enjoy the same degree of protection from environmental and health hazards and equal access to the decision-making process to have a healthy environment in which to live, learn, and work, so can environmental justice be achieved. Presently, socioeconomic and racial/ ethnic minorities living in urban areas face unequal access to green space facilities.

Access to green space is more recently being recognized as an environmental justice issue, as green space has proven to provide both physical and psychological health benefits to residents in surrounding communities. Highly dense urban areas

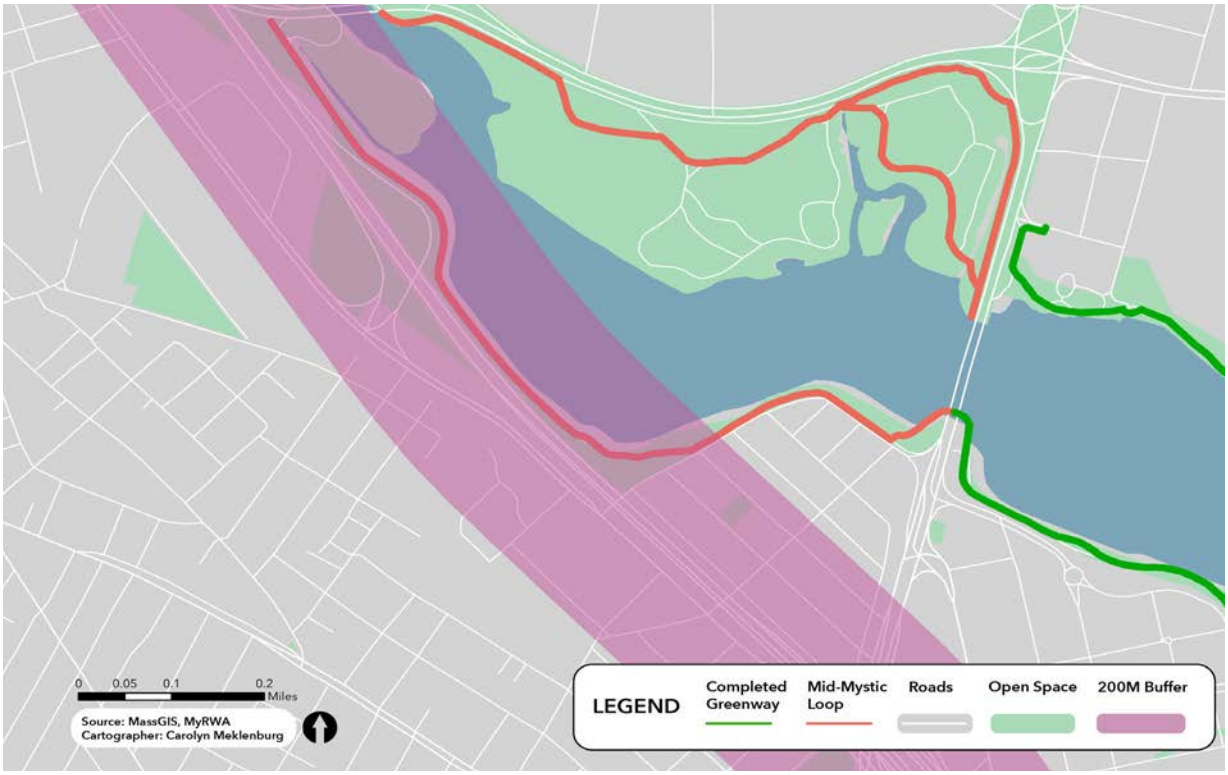



Figure 19. Map Of Blessing Of The Bay Park In Relation To The 200 Meter Buffer Zone.

are known to act as "heat islands," as the impervious concrete structures of the built environment trap heat and increase temperatures. Urban green infrastructure like parks and trails, however, provides microclimate regulation through the cooling benefits of vegetation, creating more comfortable spaces and reducing related health risks.[2],[3],[4] Green infrastructure also allows residents to experience nature, reduce stress levels, and participate in outdoor physical activity.[5] Most importantly, it is imperative that community members have equal access to green infrastructure of the same quality. The facilities and amenities of park environments directly influence park usership and whether or not residents are active in those settings.[6]

Various studies performed in metropolitan areas worldwide showcase the disparities in outdoor amenities between lower and higher income neighborhoods. In Sydney, Australia, socioeconomically disadvantaged neighborhoods were shown to have fewer park tree canopies versus parks in wealthier neighborhoods.[7] Similarly, across the United States, neighborhoods of lower socioeconomic status and higher racial or ethnic minority concentrations are less likely to have physical activity facilities such as parks and recreation spaces than those of low racial and ethnic minority concentrations.[8]

Additional studies have analyzed the effects of green urban space on health and well-being. A study in New York City compared the prevalence of street trees to cases of asthma amongst four- and five-year-olds with regards to demographic data and proximity to sources of pollution. It ultimately concluded that the presence of street trees are associated with lower instances of asthma.[9] Lastly, researchers in England observed the interaction between groups exposed to green space and income and health data to conclude that populations living in areas with more green space experienced fewer health disparities such as circulatory diseases.

Overall, there is a direct positive relationship between park use and health, as visitors have increased opportunities for recreation and physical activity.[10] This idea is exceedingly important with regards to environmental justice communities, as these residents typically lack access to the same health services as individuals of a higher economic status. Therefore, the positive health benefits of elements from the built environment must be considered in order to create and promote a healthier lifestyle for individuals of environmental justice communities. Interventions must promote solutions with equal access not only to green space, but more specifically to infrastructure of the same quality that will foster usership and activity.

## WHY HEALTH IMPACTS ARE MORE ACUTE HERE

*"The way they built I-93 through Somerville in the early 1970s was they just ripped up a mile plus of very densely settled neighborhoods, then shoehorned in the highway and left the remaining houses right up against the new I-93 segment to Downtown Boston."*

*~Wig Zamore, Community Organizer, CAFEH, Somerville Transportation Equity Partnership (STEP) & MysticView Task Force*

The original construction of I-93 was forced onto these low-income communities, who were unable to successfully push back. While the original construction was disruptive, the presence of I-93 continues to burden the community today. Proximity to highways is associated with a variety of negative health and environmental consequences, including air pollution and noise pollution. Researchers have determined that pollutant concentrations tend to dissipate over 200 meters away from the highway.[11] Additionally it has been established that noise and air pollution health side effects are particularly of concern to vulnerable populations, which includes infants, children, pregnant women and the elderly.[12] [13]

Much of Blessing of the Bay Park and a .7-mile stretch of the greenway is located within 200 meters of I-93 – and therefore

exposed to pollutants emitted from passing vehicles. The noise pollution caused by I-93 is also concerning as highways are specifically associated with low frequency sounds that are able to travel longer distances and permeate more barriers.[14] While these problems are intrinsically worrisome, they are made worse when vulnerable populations are exposed to these health risks.

There are two schools, Arthur D. Healey School and St. Polycarps School, and one daycare facility, Bright Future Educare Center, within .5 miles of Blessing of the Bay Park, and a number of other vulnerable groups located near I-93 (see Figure 6. Social Vulnerability Index). Although these schools are not located within the dangerous 200 meter zone, it is possible that the schools use the park, and/or their proximity to it encourages children to spend time there. During the summer there are some day camps that allow kids to spend extended periods of time outside at Blessing of the Bay Park, which may not be healthy for them. If children, or any vulnerable population spends extended periods of time at the park, they are left exposed to the noise and air pollution effects that may lead to a host of health complications including cardiovascular, respiratory, neurological and emotional risks.

## THE HEALTH CHALLENGES OF I-93

### AIR POLLUTION

The Community Assessment of Freeway Exposure and Health (CAFEH) study has been focusing on the issue of air pollution since 2008.[15] A collaboration between Tufts University and various community

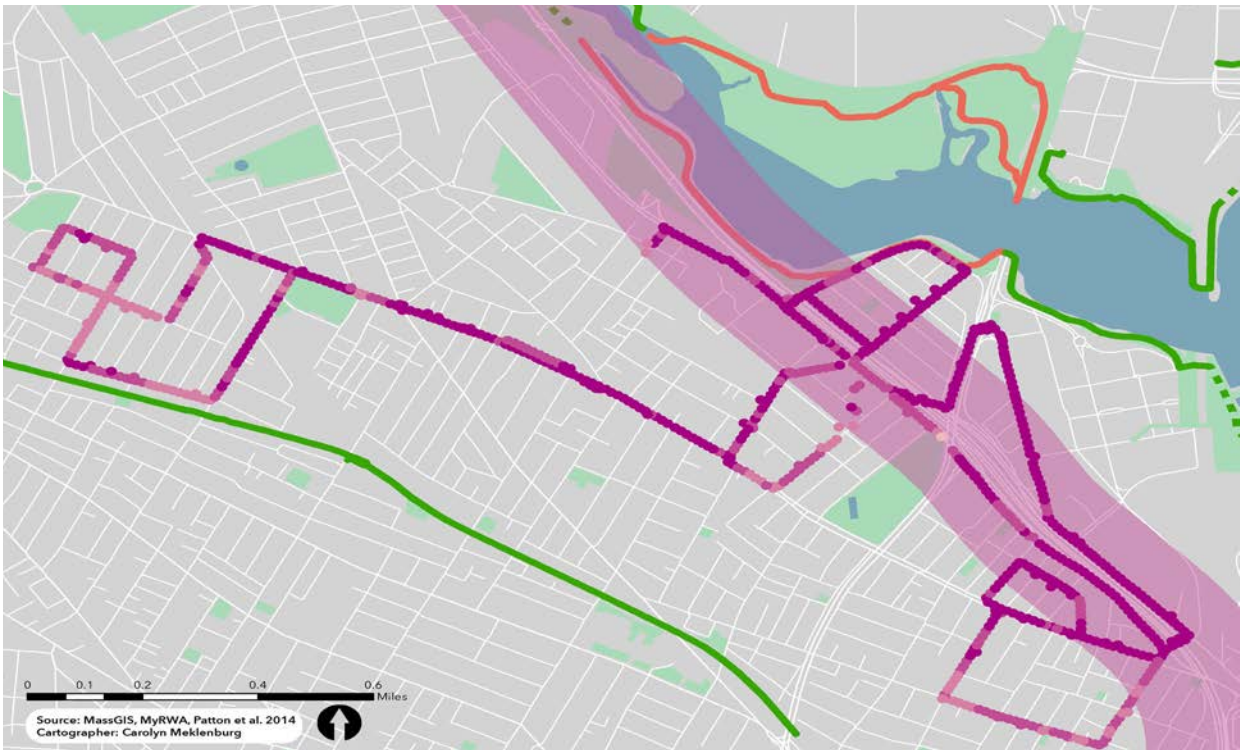



Figure 20. Air Pollution Concentrations Along Roads On A January Morning.

groups in Somerville and Boston, CAFEH utilizes a custom mobile laboratory to monitor concentrations of pollutants known as Traffic-Related Air Pollutants (TRAP) in neighborhoods at varying distances from the highway.[16] Their study area included Blessing of the Bay, a park within the Mid-Mystic Loop.

CAFEH's work indicates several variables that impact air pollution concentrations. While traffic volume certainly plays a role, they have also determined that weather conditions, time of day, and season also heavily impact pollution. In particular, they determined that on the whole"traffic-related air pollutant levels were highest in the morning compared to later in the day, higher on weekdays and Saturdays than Sundays, and highest in winter compared to the other three seasons"[17] which is shown in the two maps below. Vehicle emissions from cars on other nearby roads also contributed to these concentrations in combination with those from the interstate.[18]

Such findings are significant when considering public health. CAFEH studies have demonstrated clear correlations between exposure to high concentrations of pollutants and cardiovascular disease.[19] Although not as strong of a correlation, there have also been demonstrated relationships between pollutant exposure and respiratory conditions in children and vulnerable adults, lung cancer, and most recently, neurological conditions (autism in children, and increased cognitive decline in older adults).[20] These findings indicate the need for additional longer-term studies to better determine impacts of long-term exposure to these pollutant concentrations.[21]

## NOISE POLLUTION

In addition to air pollution, I-93 also contributes to noise pollution, which is associated with a myriad of health

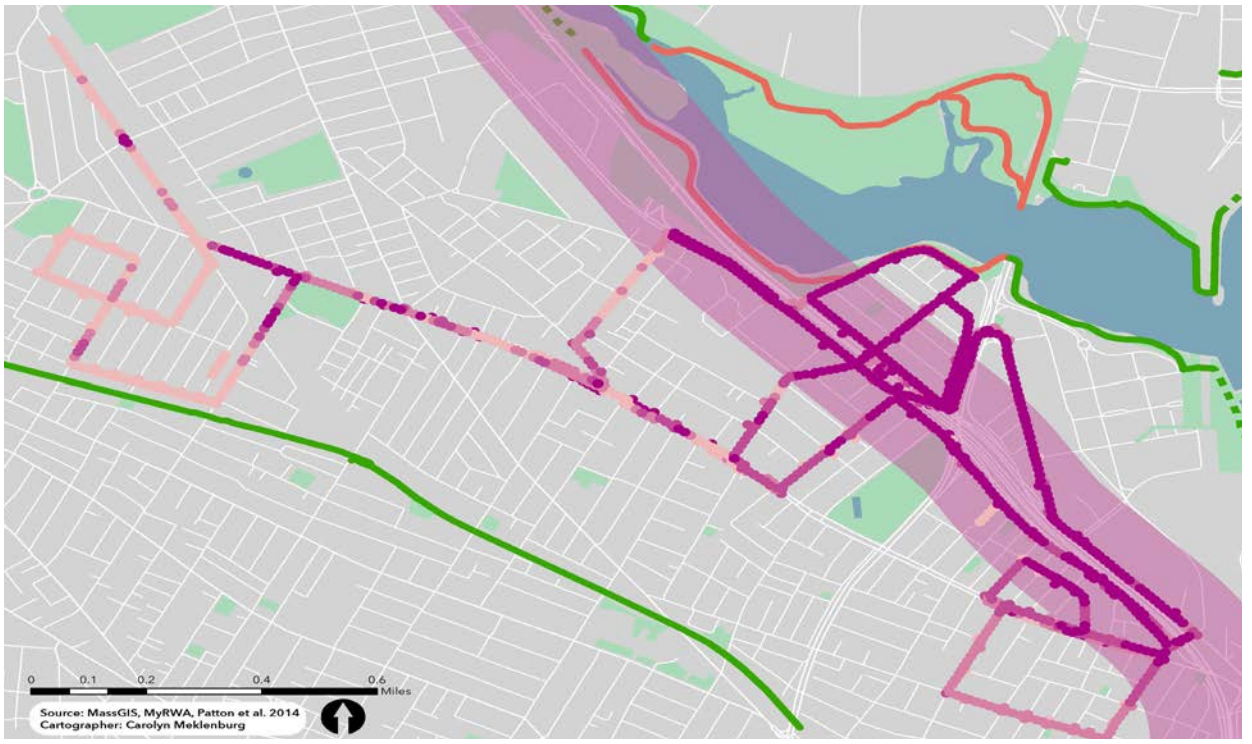



Figure 21. Air Pollution Concentrations Along Roads On A July Morning.

| Plan Details | How The Plan Seeks to Improve Health Around The Mid-Mystic Loop | What's Been Implemented |
|---|---|---|
| **Medford Square Master Plan**<br><br>**Lead:** MAPC, City of Medford<br>**Year:** Published September 2017<br>**More information:** https://tinyurl.com/y73o4sr6 | • Make the Mystic River a focal point of recreational activity by creating playgrounds and better board walk connections. | N/A |
| **Winter Hill Neighborhood Plan**<br><br>**Lead:** Somerville<br>Year: 2016<br>**More Information:** https://tinyurl.com/yc8ewy5r | • Erect a sound barrier - but in a "Somerville way" – for I-93 where Winter Hill would connect to Ten Hills. The sound barrier would be made from a solar array (solar panel shield). | N/A |
| **Lower Mystic River Corridor Strategy**<br><br>**Lead:** BRA, MAPC<br>**Year:** Published in June 2009<br>**More Information:** https://tinyurl.com/ychjpqvy | With 50 million dollar federal investment in biking and walking VAST-Net, along with a number of other related projects that do not address health as this report defines it, will develop a team of "regional circuit riders" with expertise to assist the communities' plan, promote and implement bicylce and pedestrian programs and projects. These experts will:<br><br>• Assist communities review their local zoning requirements as they relate to walking and bicycling and work with the communities to develop ordinance amendments and policies to support active transportation.<br><br>• Work with local school districts to support programs to improve and/or implement "Safe Routes to School" programs in each community and to support the development of joint wellness education curriculum that offers classroom experience on Active Transportation, programs teaching bicycling, bicycle safety and walkability assessments.<br><br>• Help coordinate and prepare plans and funding applications for regional active transportation improvements. Professional development programs for planners, engineers and department of public works staff will be developed to build the long-term in-house capacity of the communities to manage and maintain active transportation infrastructure. | N/A |

| Plan Details | How The Plan Seeks to Improve Health Around The Mid-Mystic Loop | What's Been Implemented |
|---|---|---|
| **Somervision**<br><br>**Lead:** City of Somerville<br>**Year:** Adopted by the Somerville Planning Board April 19th, 2012<br>**More Information:** https://tinyurl.com/ybznr2qo | • Support Walk-Ride Days and the goal of shifting mode choice to more active and sustainable means by having the City sponsor/promote the event and encourage local elected officials and municipal employees to participate.<br><br>• Advocate for infrastructure projects that mitigate the adverse impacts of highway infrastructure, with particular attention to providing greater access and connectivity to pedestrians and bicyclists and addressing health and quality of life impacts experienced by abutters.<br><br>• Consider the creation of a living wall (e.g., sound and visual barrier that also contains plant materials) to address air quality issues and mitigate the impact of Route 93 on the Mystic River, boat launches, paths, and other waterfront vistas.<br><br>• Urge MassDOT and USDOT to fully mitigate the impact of Interstate 93, including air and noise pollution. | N/A |
| **Medford Open Space Plan**<br><br>**Lead:** City of Medford<br>**Year:** 2011<br>**More Information:** https://tinyurl.com/y8dvpjw3 | • Serve the active recreation needs of residents throughout Medford by upgrading the conditions of existing facilities. | N/A |
| **I-93 Sound Wall: Health Impact Assessment**<br><br>**Lead:** MAPC<br>**Year:** Ongoing<br>**More Information:** | • To Be Anounced | Health Impact Assessment is in the process of being conducted. |

complications. Noise pollution is defined as "regular exposure to elevated sound levels that may lead to adverse effects in humans or other living organisms".[22] More generally stated, noise is unwanted sound. Noise pollution as it pertains to the Mystic River Greenways is dominated by the noise from I-93, but other sources include air traffic, emergency sirens from passing police vehicles and ambulances, loud music, and more.

*"It's a stress response. When your body feels some type of stress, you move into a fight or flight response. Your body does a number of things: your blood pressure increases, you start to sweat, but you also release cortisol, epinephrine, amylase."*

*~ Erica Walker, Community Noise Researcher*

Because noise pollution is ubiquitous and hard to escape, society often forgets, or chooses to ignore, some of its harmful side effects. Noise triggers a fight or flight response in the body, and as a result, many of the health consequences are derived from stress. Additionally, certain frequencies within noise pollution are associated with specific medical conditions. High frequency sounds lead to hypertension, also known as high blood pressure, while low frequency sounds lead to myocardial infarctions, more commonly referred to as heart attacks.[23] Highways are known to emit both low and high frequencies.

In addition to these ailments, exposure to noise pollution reduces happiness. One study looked at the differences in self-reported happiness between people that often complained about noise and those who did not, using this metric as a proxy for noise pollution exposure. Researchers then evaluated the relationship between happiness and income. The difference in happiness between those exposed to sound pollution and those who were not was then converted into a dollar amount. In the study, researchers found that to compensate for the reduction in happiness level, residents bothered by noise pollution would need to be paid 172 euros a month, or 239.44 U.S dollars, to achieve the happiness level of those not bothered by it.[24]

In models of noise pollution, certain characteristics of roads are found to increase noise pollution decibels. First, proximity to a road increases mid-range frequencies while the width of the road positively correlates with sound levels. The type of vehicles travelling on the road plays a role in sound pollution as well. Heavier vehicles are associated with low frequency sounds, and a higher number of vehicles on the road led to a statistically significant increase in decibel high frequency sounds. [25]

## OPPORTUNITIES FOR HEALTH

### NATURE

Although the highway presents a number of health concerns, the Mystic River Greenway and the Mystic River itself counterbalances these concerns with its potential for health amelioration. During the warmer months and as the sun rises, land radiates heat from the ground and warms the air directly above it. This causes the air to rise, creating a vacuum. Air directly above the river, which is still cool,

Photo: Kayle Kaupanger, Unsplash

moves toward the vacuum. This air then heats up and continues the cycle, causing a "sea breeze" to form.

During the night the reverse is true. Air above the water is warmer and rises up, and cooler air above the land fills in the vacuum, creating a "land breeze." Both breezes push pollutants up and away from the greenway, parks, and people using them. Therefore, the presence of wind, and by extension the presence of the Mystic River, improves the air quality around the area. This is why the health risks for people using the parks and trails is worst during cold, windless, winter mornings during rush hour when the most pollutants are present without any natural dispersal.

Noise pollution levels are also reduced by the presence of nature as well. Foliage from trees and bushes along the greenways absorb sound waves or reflect them back which makes the space quieter.[26] Green space not only physically reduces sound, but also psychologically reduces annoyance caused by noise pollution.[27] An increase in open space is shown to reduce low frequency sounds, which typically travel further and are able to permeate buildings.[28] Green space, and more specifically parks, are hypothesized to give humans a feeling of control over their environment, and also act a visual barrier between people and the source of noise pollution. The visual barrier distracts from the sound, and thus reduces the amount of stress caused by the noise.[29] The presence of parks therefore potentially mitigates the health concerns raised by highway noise due to the reduction in stress, which is largely what causes many of the adverse side effects of noise pollution.

## ACTIVE TRANSPORTATION

The greenways not only provide green space to the public – they offer a spot for physical recreation and active transportation, which is associated with ample positive health effects that outweigh the adverse ones caused by pollution. Not only does active transportation provide an opportunity for cardiovascular exercise, which is associated with numerous health benefits, but it's also affordable, opening it as a possibility for all the communities the Mystic River Greenway serves.

Cycling has been shown to improve cardiovascular risk level factors and fitness, and prevents anxiety and depression.[31] Additionally biking in green areas, like the Mystic River Greenways, may improve self-esteem and mood more than traditional exercise due to the synergistic effect of exercise and exposure to nature.[32] One study in Copenhagen has even found that cycling to work reduced the risk of mortality by 28%.[33] As low-cost, zero-emission, calorie-burning transportation methods, bicycling and walking can help people achieve better health and wealth.

However physical activity increases respiratory uptake, allowing more air pollutants to access the lungs and exacerbating the risks of harmful effects.[34] In highly air-polluted environments like the portion of Mystic River Greenways located near I-93, this can be problematic. A study from Copenhagen revealed that bicyclists get a much higher dose of air pollution than people in cars on the same roadway - about four to six times as great.[35] Additionally, a 17-year study conducted in Denmark with over 52,000 participants analyzed the combined effects of physical activity and air pollution on mortality in elderly urban residents. In this study researchers found that cyclists in the most traffic-polluted areas tended to have higher total, cancer, and heart-related deaths than those who did not exercise, but fewer respiratory and diabetes-related deaths.[36] Although these statistics are concerning, only approximately .7 miles of the Mystic River Greenways paths are within the 200m buffer zone of TRAP, so the health risks caused by the presence of the highway should be relatively minimal for those travelling along the paths and trails.

In general, active transportation presents a net health benefit to individuals. The same study from Denmark concluded that overall sports, cycling, and gardening are excellent for reducing heart, lung, and diabetes-related deaths. [37] Similarly In 2011, researchers in Spain conducted a health impact assessment estimating the risks and benefits to health of travel by bicycle compared with travel by car in an urban environment. The study surveyed 182,000 bike share users in Barcelona, looking at the factors of physical activity, air pollution, and crashes. Overall outcomes determined that the health benefits of cycling greatly outweigh the risks.[38]

> ***"Here's the simple rule of thumb in what I'll call Western economies, or modern economies (we're not talking China or India): in all pollution levels, exercise is good for you. And no matter whether you never get exercise or you're an exercise fanatic, air pollution is always bad for you."***
>
> ***~ Wig Zamore, Community Organizer, CAFEH, Somerville Transportation Equity Partnership (STEP) & MysticView Task Force***

## SOLUTIONS

While the task of reducing noise and air pollution may be challenging, there are already some solutions available. As noted above, active transportation provides park users with the opportunity to reduce stress, anxiety and cardiovascular problems with exercise. To promote these benefits, greenways advocates like the Bronx River Alliance, a non-profit dedicated to protecting the Bronx River Greenway, has actively taken steps to increase connectivity to encourage active transportation.

While active transportation counters the negative health impacts of pollution for individual users, experts have proposed planning and policy interventions that could help to alleviate the problem of air and noise pollution on a bigger scale. CAFEH partnered with planning consultants to study the effectiveness of some commonly proposed solutions, the results of which can be seen in the table at right. Although, some of their most effective solutions are in-home filters[38] and physical barriers such as sound walls – either solid or vegetative – that push pollutants upwards so they disperse farther away from the highway.[39] Sound walls are also effective for their more traditional purpose, noise reduction, although they can

## CASE STUDY: BRONX RIVER

For best practices regarding promotion of green infrastructure and healthy activity, we looked to the greenway system along the Bronx River in the South Bronx, New York City. The Bronx River Alliance is the local community organization that has spearheaded development and activation of the Bronx River Greenways, much like MyRWA has done with the Mystic. There are multiple parallels regarding density of neighborhoods, community demographics, and current conditions of the greenway system.

In the Bronx as in Greater Boston, effects of pollution and vehicle congestion on residents of the South Bronx have been a major concern. The New York City Department of Parks & Recreation (NYC Parks) has legal authority over the Bronx River and its greenways, and was able to collaborate with the NYSDOT on studies with funding provided by the Federal Highway Administration (FHWA). Project managers were able to plan, design, and construct parks along the Bronx River that complied with the federal standards and regulations.

Access to the river and greenway system is also a highly-regarded priority for the Bronx River Alliance, especially as it abuts communities whose residents have a low rate of vehicle ownership. As an example, in the neighborhood immediately surrounding Starlight Park - a newly constructed park along the greenway - the rate of vehicle ownership is currently only 38.5% - compared to the national average of 91.3%. A major partner of the Bronx River Greenway is the New York State Department of Transportation (NYSDOT), which has begun to activate routes that feed into various points along the greenway. Examples of activation include on-street intersection projects that will improve safety and connectivity for both pedestrians and cyclists, and on-street connector lanes.

However, as transportation issues persist in the Bronx, partner agencies of the Bronx River Greenway are determined to provide access routes with safe environments for active transportation commuters. The principle recommendation has been to establish safe separated bicycle and pedestrian facilities that can be contained within busy city streets. Additional innovative measures are the transformation of a brownfield corridor into a transportation and recreational asset, and the construction of three pedestrian bridges - two over the river and one over Amtrak rail lines.

Furthermore, the Greenway directly links residents and workers to trains and busses. With an efficient greenway system, residents become increasingly less dependent on vehicles, and can instead turn to multimodal transportation choices for their daily commutes. It also gives people the opportunity to skip the congested rapid transit system altogether, save on transportation costs, and instead rely solely on cycling or walking. Finally, increased rates of active transportation create improvements in air quality, reduce greenhouse gas emissions, and promote public health.

Photo: Alesia Kazantceva, Unsplash

be costly. Each mile of 14-ft sound wall costs approximately $3.9 million, but can reduce noise levels by 50%.[40]

Similar to sound walls, increased vegetation and speed reduction both reduce air and noise pollution. California's Environmental Protection Agency recently released a report entitled "Strategies to Reduce Air Pollution Exposure Near High-Volume Roadways," in which they have included a table summarizing their findings on pollutant reduction solutions. While many overlap with those proposed by CAFEH—solid and vegetative barriers and indoor filtration—they also include traffic management strategies that could help to control traffic emissions such as speed limit reductions, traffic signal management, and infrastructure to reduce speeds.[41] Speed reductions would also limit the amount of noise produced, thus making it quieter overall.[42] The introduction of vegetation was also recommended by Erica Walker, expert and author of a number of noise pollution papers. The leaves of trees and other vegetation absorbs sound waves and by extension reduces noise. These trees ideally would need to be broad leafed and evergreen for the noise reduction to last year-round.[43]

The recent publication dates of many of these studies demonstrate that this issue is timely, however few city plans that encompass the Mid-Mystic Loop have made concrete recommendations to address the concerns of air and noise pollution in the area. While almost all plans recognize that air pollution should be avoided or mitigated, these recommendations often come in the form of goals rather than specific actions. Additionally outdoor air quality is very rarely addressed, as most recommendations suggest the implementation of air filters. Noise pollution is even less frequently considered, and virtually no plans address air and noise pollution in the Mid-Mystic Loop. However, a number of plans recognize the potential for active transportation and recognized that active transportation leads to a healthier lifestyle and a reduction in air pollution.  While plans rarely address active transportation in the Mid-Mystic Loop they have called for both physical road improvements and more community events to encourage active transportation as a whole.

Many experts in the field are only now recognizing the severity of this problem and actively working on ways to improve the health of residents living near this kind of air and noise pollution. It is critical that this

work is considered when making planning decisions for the Mystic River Greenways to ensure such a community resource remains a positive asset for the health of its users. The presence of the greenways is not enough. The communities bordering the Mystic River Greenways deserve high quality parks that improve the health of the people who frequent it. Future planners must take air and noise pollution into account to ensure that the greenways fully maximize their potential as a space of recreation and active transportation.

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# 7 ACTIVATION

*"What would attract people most, it would appear, is other people."*

*~William H. Whyte, American Urbanist*

# INTRODUCTION

Activation is the final key component in successfully attracting more users - by foot, by bicycle, by public transit, or by vehicle - to the many parks that liek alone the banks of the Mystic River. If users solely can access the park just as a means of passing through, even if the potential health concerns have been mitigated, it is still not enough to transform the riverfront into a true community open and green space.

Place activation involves the planning for diverse human activity in one place, and can be done in a variety of methods. From providing basic amenities such as benches and picnic tables to scheduling programmed activities and events, activation is vital in ensuring that the needs of all potential users within a particular space are met, as it will provide for the natural, organic, and sustainable use of places by people as part of their daily life. In turn, having a place full of people will attract more people, as noted by William H. Whyte, former American urbanist and pioneer in the study of human behavior in urban settings.

Particularly in dense, urban areas, public green spaces provide a relaxing haven for the hustle and bustle of the metropolitan life. Riverfront parks, specifically, not only have the potential to enhance the beauty, culture, and history of urban centers, but also serve as an escape whose natural environment exudes tranquility. They are safe spaces where users can sit in the sun with friends, fish along the banks of the river, host birthday parties, or play sports and other recreational games. Furthermore, with proximity to a downtown core, riverfront parks can connect park users to the local businesses and contribute to the growth of the local economy.

## ACTIVATION IN CONTEXT

There are several parks located along the Mystic River that have the potential for increased usership if properly activated. Two such parks are Blessing of the Bay in the Ten Hills neighborhood of Somerville, and Torbert MacDonald Park in the Wellington neighborhood of Medford. Both parks are located within walking distance from central downtown districts - Winter Hill in Somerville and Medford Square - and are additionally situated within dense residential areas.

Presently, both of these parks lack a number of basic amenities that would naturally draw users to the area to spend an afternoon outdoors. At Blessing of the Bay, a local canoe and kayak rental program known as Paddle Boston, currently has a boathouse, making this park the only spot along the Mystic River to promote public boating trips and events. However, this is merely a seasonal operation that opens in the beginning of May and lasts through the end of October.

Likewise, Torbert MacDonald Park, just across the River and over twelve times the size of Blessing of the Bay, also lacks

***"I think there's a lot of opportunity for public art and creative engagement with the river. Building paths is the way to give people access to the river, but improving the experience as you're traveling on that path is an interesting angle as well."***

***~Allie Fiske, Executive Assistant to the Mayor of Medford Business and Cultural Liaison***

basic park amenities that would draw more users to enjoy its natural elements. Existing features include an observatory tower that offers views of the Mystic River and the Boston skyline, though the structure is in need of restoration. Additionally, there is a fishing pier along the bank of the Rier, as well as some park benches - including those which are currently under construction along with some picnic tables. Given the extensive amount of land that MacDonald Park covers - 63 acres - there is much room for additional programming that could enhance user experience of both the park and the Mystic River.

The Mystic River Watershed Association (MyWRA) has exemplified activation efforts through its various programming events including the annual Herring Run - a 5k road race and 3, 9, or 12 mile paddle race around the Mid Mystic Loop. Other seasonal events include park cleanups of both waste and invasive species, as well as tree plantings and educational events.

However, there is still ample room for the many other organizations across Somerville and Medford to use the parks to their advantage. Following in MyRWA's footsteps by hosting programming at the Mystic River parks would allow local organizations the opportunity to self-promote while simultaneously engaging the community members. If executed with keeping the community, the people, in mind, activation efforts can be long-lasting.

Many local, state, and regional plans consider activation in the Mid-Mystic Loop (see chart on next pages). Unlike access and health, more action items from these plans have been implemented in the realm of activation.

## A GUIDE TO ACTIVATION

Activation offers a way to strengthen the connection between people and the places they share.[1] Two such ways of achieving this connection are securing community input through a series of outreach tactics, and utilizing placemaking techniques that offer a physical connection between the community members and their home.

### COMMUNITY ENGAGEMENT

Establishing community ownership of a project is a key aspect to the success of creating a space that the community itself will be able to enjoy. Especially for places that already exists, community members are presented with an opportunity to reimagine a space that they already enjoy, yet still see the potential for a transformation.

Devising a true collaborative process to engage members is as important as the result itself. It takes more than basic conversation and a few public meetings to truly make the community members aware of the project at hand and its potential impact.

Currently, MyRWA is teaming up with Groundwork Somerville to launch the transformation and redesign initiative for Blessing of the Bay Park. An initial meeting on April 8, 2018 consisted of a public workshop that educated and engaged Somerville residents in the redesign process.

The meeting began with an introduction by Groundwork Somerville and MyRWA, explaining both the history of Blessing of the Bay and the present conditions of the Mystic River. The presentation displayed various types of activation tactics - from programming and events, recreational fields, play structures, a new fishing and boat pier, etc. - and multiple precendents that inspired the proposed placemaking strategies.

Following the presentation, residents were asked to draw on four posters that were hung along the walls - labeled Fall, Winter, Spring, and Summer - and write down key words or phrases of ideas or visions that they have for the park during the respective season. Participants were then asked to vote in support of two ideas and vote against one.

| Plan Details | How it Seeks to Improve Activation in the Mid-Mystic Loop | What has been Implemented |
|---|---|---|
| **MacDonald Park Improvements**<br><br>**Lead:** DCR<br>**Year:** 2016<br>**More Information:** https://tinyurl.com/ybr46o4n | • Create communal gathering space<br>• Rain garden for efficient collection and filtering of stormwater<br>• Increase pedestrian accessibility to river | • Asphalt walkways 8"-10" wide<br>• Removal of invasive plant species (phragmites) |
| **Medford Open Space and Recreation Plan**<br><br>**Lead:** City of Medford<br>**Year:** Updated 2011<br>**More Information:** https://tinyurl.com/y8dvpjw3 | • Implementing riverfront open space connections for bicycles and pedestrians through path improvements and water taxis<br>• Initiation of historic walking tours<br>• Creating the Medford Riverwalk: Connecting Alewife Brook to Mystic Valley Parkway to Main Street | • Complete reconstruction of Riverbend Park<br>• Installation of play structures at Dugger Park<br>• Community gardens at Hormel Park<br>• Development of plan and conceptual design to provide riverfront open space connection between Hormel Park and Medford Square<br>• Construction of Clippership Drive and Clippership Park as part of riverfront open space connection initiative<br>• Start of work on Wellington Greenway Project |
| **Medford Square Master Plan**<br><br>**Lead:** MAPC, City of Medford<br>**Year:** Published September 2017<br>**More Information:** https://tinyurl.com/y73o4sr6 | • Improve riverside plaza<br>• Design and pursue riverfront parks<br>• Create culture and arts district<br>• Improve key street corridors<br>• Integrate district wayfinding<br>• Add sharrows, bike lanes, and bike signs<br>• Redefine the central intersection for walking | • Krystle Campbell Memorial Peace Garden<br>• Construction underway of the Cradock Bridge Rehabilitation over the Mystic River |
| **Somervision**<br><br>**Lead:** City of Somerville<br>**Year:** Adopted by the Somerville Planning Board April 19th, 2012<br>**More Information:** https://tinyurl.com/ybznr2qo | • Create infrastructure and educational outreach to support public water-based recreational opportunities and programs<br>• Actively contribute to implementation of MAPC Mystic River Corridor Strategy Project | • Improvement of public access to the shoreline<br>• Existing historic signage at Blessing of the Bay Park<br>• Herring Run at Blessing of the Bay Park |

| Plan Details | How it Seeks to Improve Activation in the Mid-Mystic Loop | What has been Implemented |
|---|---|---|
| **Mystic River Master Plan**<br><br>**Lead:** DCR<br><br>**Year:** Published November 2009<br><br>**More Information:** https://tinyurl.com/y767celx | • Signage for wayfinding and activities, natural areas, and cultural or historic features<br>• Clean-up of riverfront, stabilization of banks<br>• Replace lawn with managed meadows and successional re-vegetation<br>• Increased waterfront access and amenities, including small craft launches and pull-outs, designated fishing locations and pedestrian over looks, provision of facilities for canoe/kayak rental and benches and picnic tables<br>• Facilitate connection between River and adjacent open space and recreational corridors | • Paddle Boston boathouse at Blessing of the Bay Park<br>• Fishing pier at Torbert MacDonald Park<br>• Shopping area and MBTA Orange Line stop at Assembly Square<br>• Construction underway of Wynn Casino which will feature riverfront promenade and additional greenway connections<br>• Current repaving of paths and construction of benches and picnic tables at MacDonald Park<br>• Herring Run at Blessing of the Bay Park |
| **The Lower Mystic River Corridor Strategy**<br><br>**Lead:** BRA, MAPC<br><br>**Year:** Published in June 2009<br><br>**More Information:** https://tinyurl.com/ychjpqvy | • Public boat access at Gateway Park in Everett<br>• Improvements to Condon Shell outdoor venue in Medford: create better performance site, preserve river's edge to allow for boat passage, provide pedestrian link to Medford Square | • Blessing of the Bay Boathouse<br>• Public events at Condon Shell, including the annual Mystic River Celebration |

For the last activity, meeting participants were divided into groups and were presented with a lanscape map of Blessing of the Bay. By engaging in discussion and using stickers and makers, everyone contributed their ideas regarding both thecurrent and future state of the park - including what aspects they enjoy or dislike, and what they envision for the future.

By using both the ideas that were proposed and most heavily voted on for each season, as well as the maps that were drafted by participants, both MyRWA and Groundwork Somerville will draft design renderings for Blessing of the Bay Park. The designs will be presented to the community at the next meeting on May 24, 2018, at which participants will be able to express their opinions regarding the proposed renderings.

The significance of a step-by-step process of engagement can truly be emulated in a community space where all residents feel as though they were able to play a role in the transformation of an important shared space.

## TACTICAL URBANISM

Sometimes known as "guerrilla urbanism," "city repair," "DIY urbanism," or simply vandalism, tactical urbanism is defined as a collection of low-cost, temporary changes to the built environment, usually in cities, intended to improve local neighborhoods and city gathering places.[2] It is typically described as having the following characteristics:

- A deliberate, phased approach to instigating change
- The offering of local solutions for local planning challenges
- Short-term committment and realistic expectations
- Low-risks, with a possibly high reward
- The development of social capital between citizens and the building of organizational capacity between public-private institutions, non-profits, and their constituents[3]

Tactical urbanism is another of the most efficient and effective methods to activate the parks along the Mystic River. A method to kickstarting this effort is to involve the local organizations across Somerville and Medford, such as arts organizations. Members of the organization could organize and partake in placemaking efforts such as painting the streets surrounding the park or the greenway paths themselves. The parks could also serve as a location for display of public art. Both of these efforts not only engage the organization in community participation, but also make community members aware of the organizations and groups of people that add to the cultural diversity of the area.

Photo: Nwa Democrat-Gazette/J.t. Wampler: Volunteers On July 23 Paint A Crosswalk And Curb Extensions At Church Avenue And Center Street In Fayetteville, Arkansas As Part Of The City's Tactical Urbanism Program.

## CASE STUDY: CONCORD RIVER GREENWAY, LOWELL, MA

While many associate Lowell, Massachusetts with the Merrimack River, the Concord River also flows through the city, joining the Merrimack in the city center. Like the Mystic, the Concord River has received far less attention and investment than its more famous counterpart. Nonetheless, the Lowell Parks & Convservation Trust has been working for over twenty years to ensure that the Concord River has an identity of its own as "Lowell's hidden jewel."[4] LP&CT has become the main advocate for the Concord River Greenway, a city-owned, public trail alongside the Concord. Currently, in three separate sections, the trail will eventually connect the city with other local trail networks, including the Bay Circuit Trail and the Bruce Freeman Rail Trail.[5]

Over twenty years in the making (and still in process), the Concord River Greenway exemplifies the challenges facing urban greenway development.[6] These challenges include navigating land ownership, new development, and city politics. Jane Calvin, Executive Director of LP&CT, explained her strategy for keeping the momentum behind such a lengthy project: "You have to make sure that people know you're being proactive." Most recently, a local car dealership expansion threatened a critical connection between the Concord River Greenway and the Bruce Freeman Rail Trail. Through garnering public support, political savvy, and working closely with the dealership owner and engineer, LP&CT was successful in ensuring that the plans for the dealership expansion must include a portion of trail.[7]

Calvin feels that it is through active placemaking that LP&CT has been able to engage the community and garner support for the project:

> *"I think you have to meet people where they're at, and tap into whatever their interests are. That was the intention of our multi-lingual signage along the Greenway. If they are interested in the nature around them, we have that natural resources sign. If they're interested in the industry and community around them or the city's industrial history around them, they could read about that. We also offer a variety of programming along the Greenway. All those things engage different populations of people in the corridor, and then all those people come to it from whatever their level of interest is. And it's not forced, it's not vague, it's authentic. And if anything's threatened they will go to bat for you."*[8]

Other placemaking features along the Greenway include subtle public art installations that highlight the Greenway's natural beauty while also serving as practical infrastructure.[9] Instead of a chain-link fence along an elevated portion of the Greenway, a black "text-fence" seamlessly incorporates a long quotation from Henry David Thoreau's A Week on the Concord and Merrimack Rivers so that visitors can read it while also overlooking the river. Instead of plain metal obstructions to prohibit vehicles from entering the Greenway, there are black bollards topped with figurines of local bird species (below). Calvin explains the strategy behind this kind of public art: "[Public art] features can be integrated into the infrastructure of the trail...every trail needs a fence somewhere. Every trail needs benches. The public art was not meant to standalone and require extra maintenance--they're built into the fence, into the bollards, all with a single theme."[7]

Likewise, cultural and historical societies could also involve themselves in methods of tactical urbanism. Historical societies could commission for the construction of signage, monuments, or other attributions of relative history that educate park users and community members about the past society and events that have led to the community that exists today. Cultural societies have the potential to set up pop-up shops that sell food and other goods such as crafts or jewelry that is representative of cultural identity. Programming such as this allows for all members of the community to contribute to the diverse fabric of their society.

Lastly, local governments can take charge of hosting seasonal events at the parks - from game days movie nights in the spring and summer, to fall and winter festivals, the possibilites are seemingly endless.

A more basic form of tactical placemaking is the installation of basic park amenities that will naturally attract users. Children, for example, can greatly benefit from having a playground or play structure. All park users have a need for public restrooms and drinking fountains, and during nighttime, the implementation of streetlights and lampposts provide natural elements of safety. All of the elements of placemaking share one crucial commonality: they position the human experience in everyday life above all else.

## SURVEY AND ANALYSIS

Throughout the month of April, users of the Mystic River parks were presented with a survey that asked explicit questions regarding their user experience at the parks.

Survey Question 8: How do you use the river and its parks? Check all that apply.

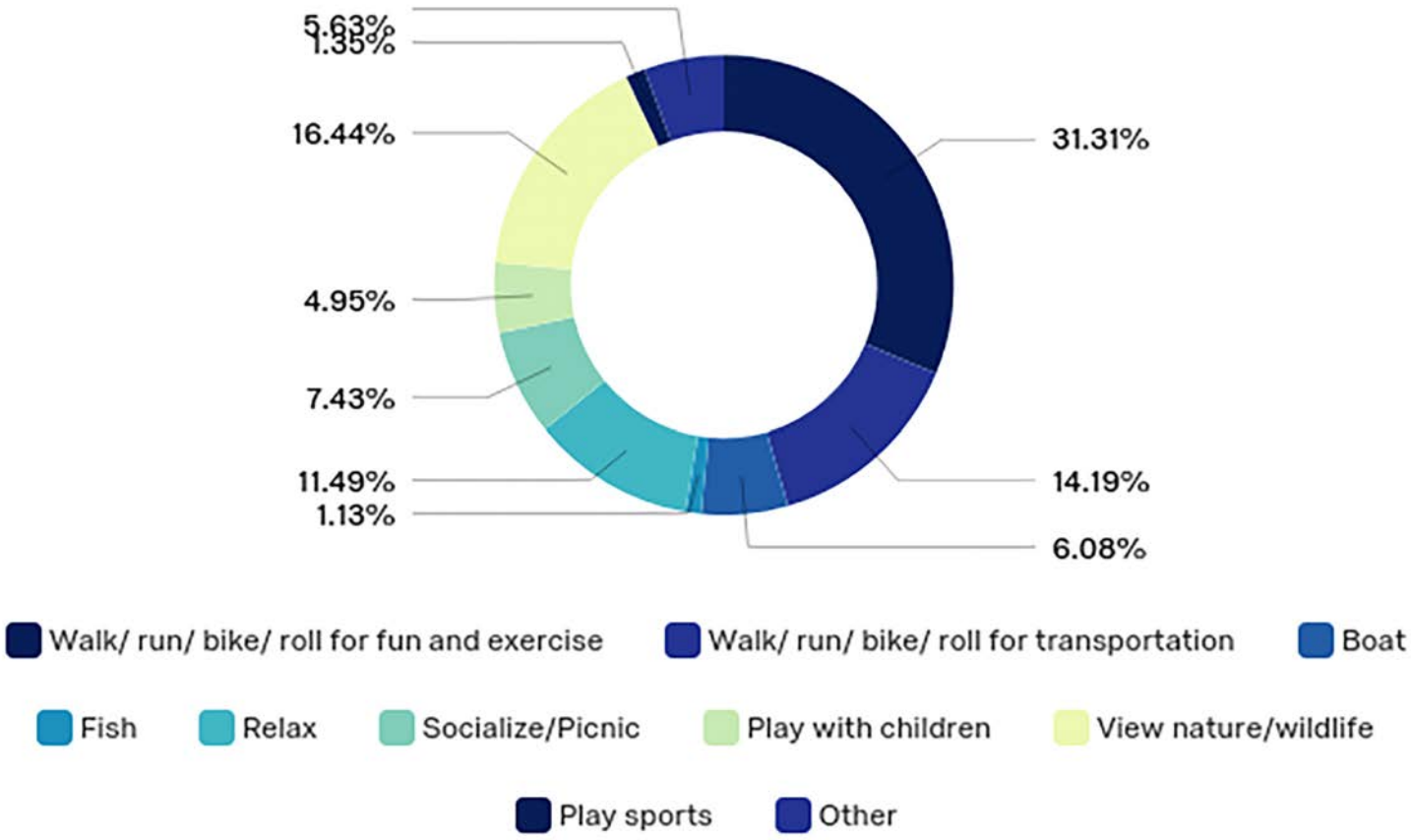



Figure 22. How People Interact With The Mystic River Greenways.

Of the 62% who do actively utilize the parks, the majority of them frequent the park to engage in exercise activity such as walking, biking, running, or rollerblading. Smaller numbers of users frequent the park to engage in non-exercise activities, such as interacting with nature (16%), relaxing (11.5%), or boating (6%).

When asked why they did not partake in additional activities apart from walking, running, or cycling, multiple users indicated that there was a general lack of park amenities that would otherwise draw a larger crowd to the park. A young man from Medford who walks with his dog to MacDonald park at least four times per week when the weather is pleasant stated that an amipitheater or similar structure would be a pleasant and useful addition to the park. It would serve as a space to host outdoor concerts or community performances, while encouraging more residents to visit the park.[8]

***"The park amenities are not really compelling."***
***~ Male Watertown Resident***

An online survey respondent, a female from Somerville, admitted that she does not feel safe at times in MacDonald park: "I've noticed the reeds are very high along some of the walks. It's intimidating for a woman to be there by herself."[9]

Many of the additional survey responders expressed that they wish to see features such as playgrounds for children, more defined gathering places for groups such as picnic areas, more local park activities, and places to sit and enjoy the river.[10] In contrast, 76 participants, or 38%, had admitted that they were do not make use of parks along the

Survey Question 10: Why DON'T you use the river and its parks? Check all that apply.

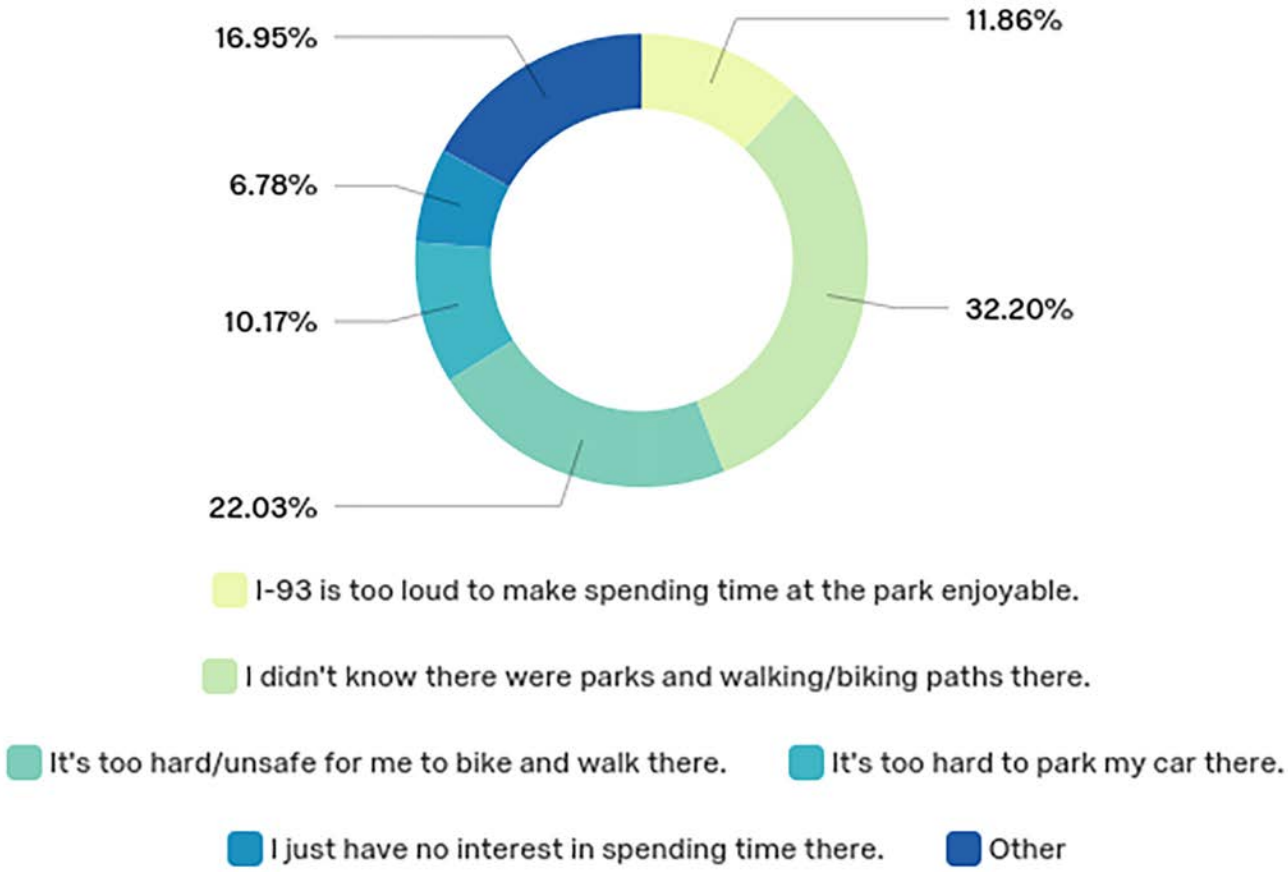



Figure 23. Why People Don't Interact With The Mystic River Greenways.

Mystic River. Of those respondents, only 11.86% expressed that the noise of I-93 is bothersome, while an astounding 32% admitted that they were unaware of the existence of pedestrian paths at the parks.

An additional 16.95% responded "Other," and upon further analysis of those answers, a number of responses regarding activation emerged.

A young mother from Malden was surveyed at MacDonald Park while she was visiting with her children, both for the first time. She initially stated that it was difficult for her to park, and though she thought the park was lovely and the noise from the highway was not an issue, she wished that there was a playground for her children.[11]Additional responses included the desire for better bike facilities, as well as the idea that the parks are not compelling enough to be chosen over other options.[12]

Endnotes


1. ParklandWA, "Vibrant Activation! An Introduction to Space Activation and Placemaking."
2. Grabow, "The Benefits of Parks and Riverwalks in Downtown: Watertown's Riverfront Plan."
3. Hine, "William H. Whyte on What Makes Public Spaces Fail & What Makes Them Succeed."
4. Gilmartin, "Why Is Placemaking Important."
5. Lowell Parks & Conservation Trust, "Concord River Greenway Park."
6. Lowell Parks & Conservation Trust, "Concord River Programs."
7. Lowell Parks & Conservation Trust, "Current Programs - Environmental Education."
8. Lowell Parks & Conservation Trust, "Fish Monitoring Program."
9. Jane Calvin, interview.
10. Richard Howe, "Lowell Week in Review: July 22, 2017."
11. Laura Pfeifer, "The Planner's Guide to Tactical Urbanism."
12. Andy Kitsinger, "Tactical Urban or Public Vandalism."

# 8 A HOLISTIC APPROACH

*"Past generations in Greater Boston knew it was their duty to improve the landscape – to build parks and seawalls, subways and bridges – for the benefit of all future residents. In 2018, we can still dream up useful new pieces of civic hardware, such as the cool new footbridge now proposed for the Mystic River between Somerville and Everett. Today, however, we keep assuming that somebody else, anybody else, should pick up the tab."*

*~Dante Ramos in the Boston Globe*

# INTRODUCTION

While we have approached our study with three separate focus areas—access, health, and activation—our research questions take a holistic approach to growing the Mystic River Greenways:

- ***What are the obstacles to healthy enjoyment of the Mystic River and its greenways?***
- ***How will investment in the greenway system improve active transportation and open space recreation for the communities in the Mystic River watershed?***
- ***What policy and planning solutions can we recommend?***

Our recommendations therefore take this same holistic view. Some previous plans take a similar approach, but the focus has remained largely on access and activation without considering chronic health impacts of the greenway's proximity to I-93. Since our research has demonstrated the critical need for bringing health relative to air and noise pollution into this conversation, we have included it in our recommendations—differentiating our work from prior planning efforts. In emphasizing the holistic nature of our recommendations, we hope to make it clear to future funders that investing in one project will actually address more than one critical need.

We conclude our recommendations with a description of funding sources that may soon be available through various legislative measures at the state and municipal levels. We hope this serves as a useful tool for advocates so that they can remain aware of these measures, and ensure that the Mystic River and its greenways finally gets the attention it needs and deserves as a centerpiece of Metro Boston.

## DEVELOPING RECOMMENDATIONS: OUR METHODS

Our recommendations are based on our interviews, our route audits, our survey results, and our case studies. We accompany each recommendation with the research on which it was based.

## MAPPING SOLUTIONS

The following map locates our recommendations to demonstrate their distribution throughout our focus area. While our recommendations for activating the greenways and mitigating the health impacts of noise and air pollution remain focused around the Mid-Mystic Loop, the intersections identified in the "Access" chapter are within walking and biking distance of the loop.

## SOUNDWALL
1a. Along I-93

## INTERSECTION IMPROVEMENTS
2a. Route 16 @ Mystic Ave & I-93
2b. Winthrop Rotary
2c. Temple St. & Mystic Ave
2d. Shore Drive & Mystic Ave.
2e. Wellington Circle
2f. Main Street & Mystic Ave.
2g. Kensington Underpass
2h. Grand Union Boulevard & Mystic Ave.
2i. Sullivan Square
2j. Santilli Circle

## INFRASPACE IMPROVEMENTS
3a Temple St. @ I-93
3b. Kensington Underpass
3c. Grand Union Boulevard @ I-93

## ELEVATED CONNECTIONS
4a. Mystic Valley Parkway
4b. Mystic Ave
4c. I-93
4d. Wellington Circle
4e. Sullivan Square
4f. Santilli Circle

## POLLUTION ADVISORY SIGNAGE
5a. Blessing of the Bay

## IMPROVED PARK AMENITIES
6a. Torbert Macdonald Park
6b. Blessing of the Bay

## WAYFINDING: GATEWAY SIGNS
7a. Blessing of the Bay Entrance
7b. Torbert Macdonald Park Entrance
7c. Turn off Mystic Valley Parkway
7d. Wellington Entrance
7e. Andrews Middle School Entrance

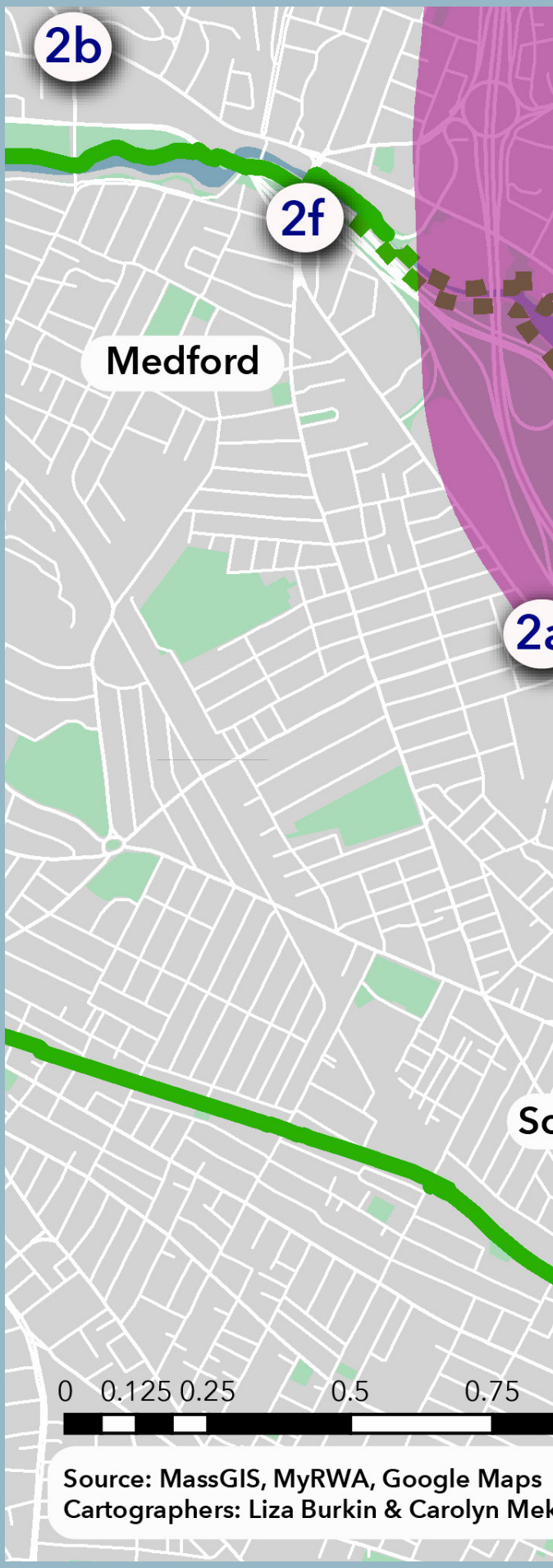
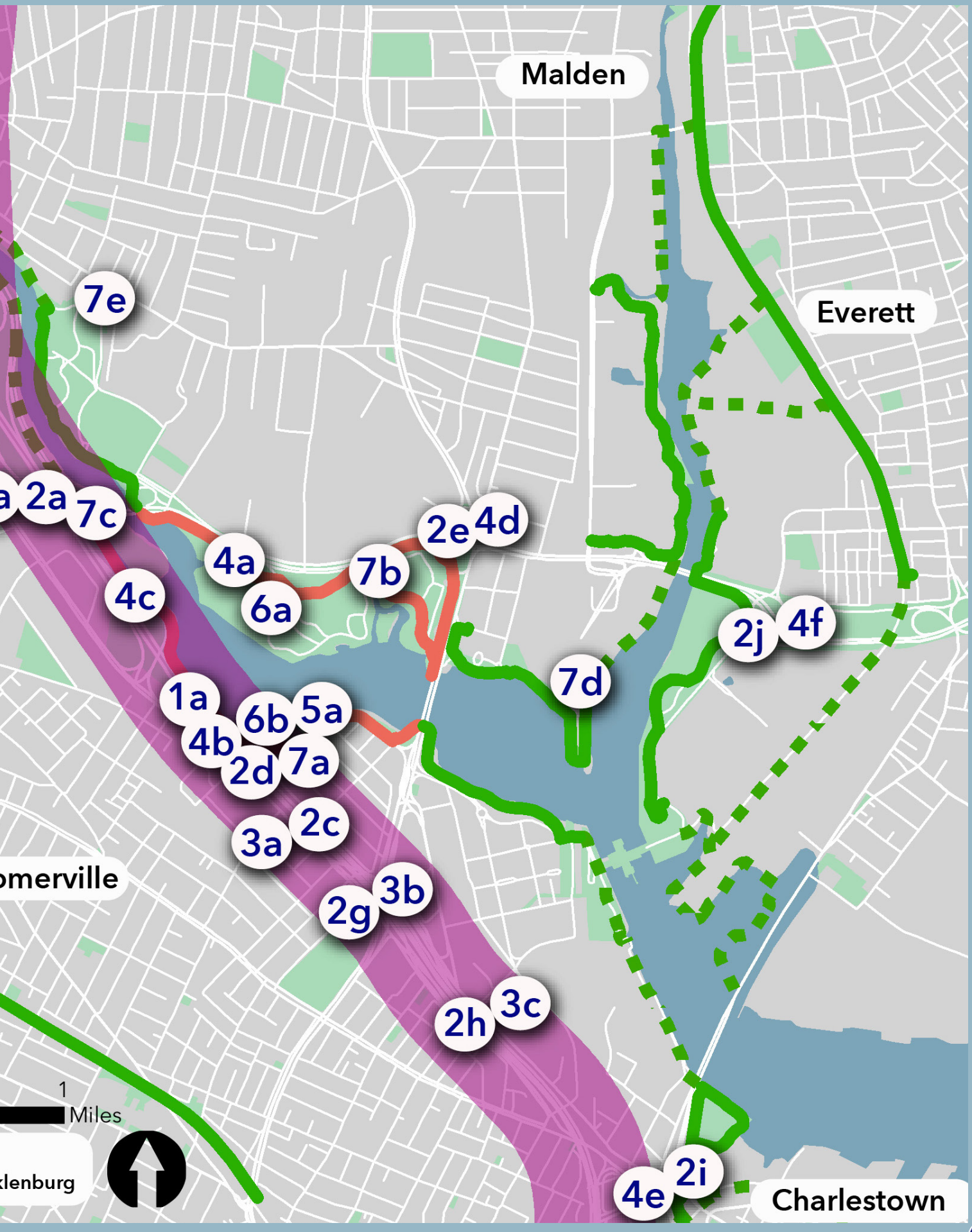



Figure 24. Locations Of Recommended Changes.


Malden
Everett
Charlestown
omerville
klenburg
7e
a
2a
7c
4a
6a
7b
2e
4d
4c
2j
4f
7d
1a
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Miles

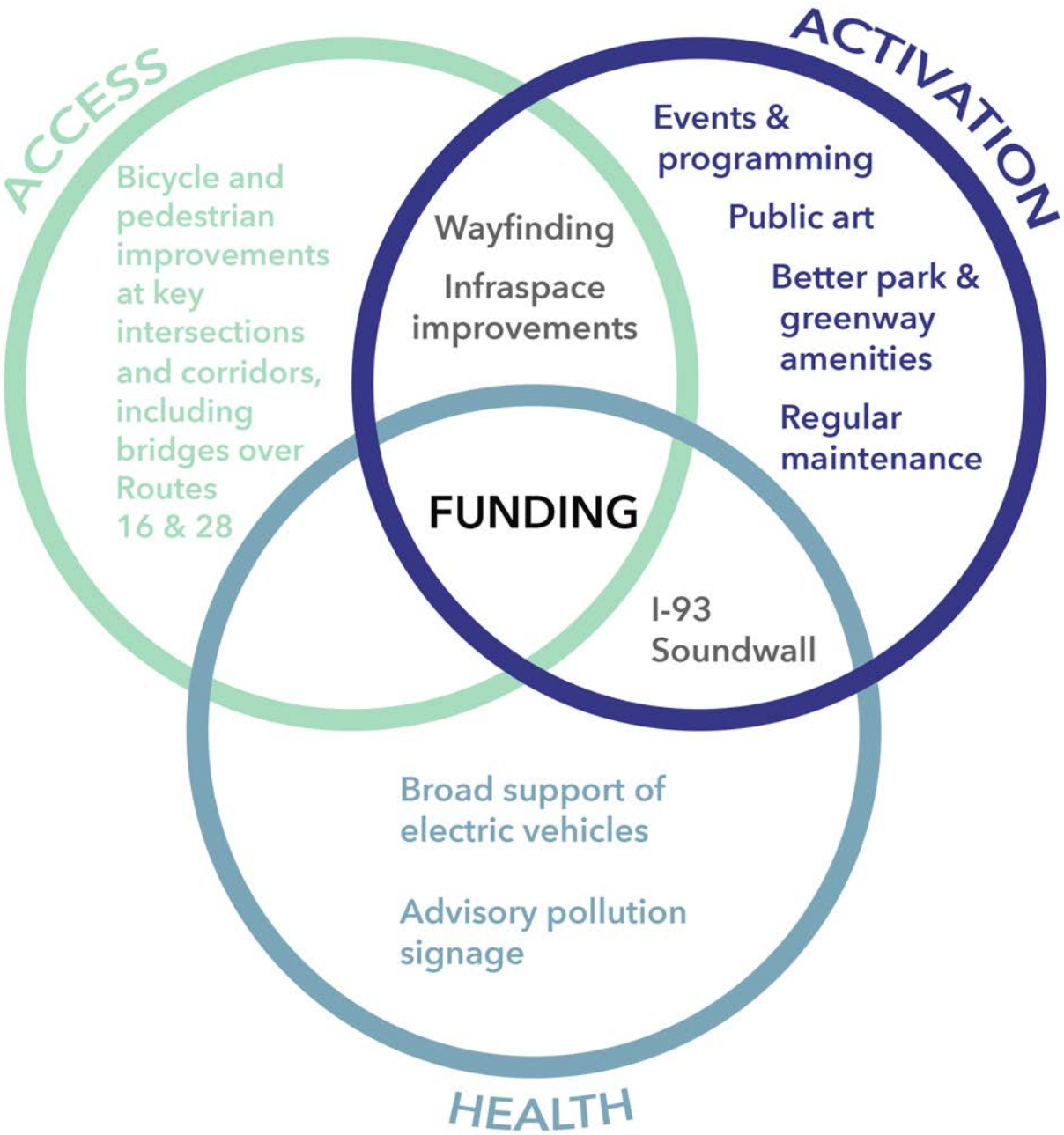


Figure 25. Venn Diagram Of Solutions.

There are a number of plans to that attempt to address the the access, and activation concerns that were raised in the previous sections, however very few address health. The following recommendation address all three concerns in a holistic manner where in many of the solutions address multiple problems at once. One additional, but key component of this section that separates this report from past plans, is the inclusion of a funding section. From a number of interviews, it became apparent that community members were were open to greenways and access improvements, but funding was limited. While the design suggestions proposed in this section greatly improve  access to the greenways, and health and activation in and around the Mid-Mystic Loop, they are meaningless if they never get implemented.

## SOUNDWALL

**ADDRESSES:** Health and Activation

**BENEFITS:** As previously mentioned the creation of a sound wall is crucial to limiting pollution exposure to park goers and greenway users. Sound walls not only block noise, but also forces air pollutants upward, giving them time to dissipate, which is key for those cycling, running or exercising within the 200m buffer zone.[1, 2]

**COST:**

| Material Type | Sound Attenuation/ Dollar |
|---|---|
| Earthen Berm | .72 |
| Concrete | .61 |
| Fiberglass | .45 |
| Wood | .38 |
| Steel | .38 |
| Clear (Transparent) | .38 |

**LOCATION:** Along I-93 where the highway is within 200m of the Mid-Mystic Loop

**EVIDENCE:** Of the 59 people who said that they did not interact with the Mystic River or the greenways, approximately 12% of people said that the noise produced by I-93 was a contributing factor. The addition of a sound wall along I-93 where it runs adjacent to the Mid-Mystic Loop would address this problem as well as chronic health concerns.

Despite the benefits of sound walls, there are several considerations that planners should take into account. Sound walls can be expensive, are not always aesthetically appealing, and the raised nature of I-93 would complicate construction in some locations. However, according to our interviews with Doug Brugge, Wig Zamore, Erica Walker, and State Representative Mike Connolly, the health mitigation benefits would outweigh these challenges.

There are many different types of sound wall materials available that accommodate differerent priorities. Concrete walls are less expensive but are very efficient at blocking sound. While not visually pleasing at first,

Sound Wall Rendering By MyRWA.

## CASE STUDY: WOONASQUATUCKET RIVER GREENWAY, PROVIDENCE, RI

Just 50 miles south of Boston, Providence is also a city built on rivers that cradled the Industrial Revolution – and then suffered dire consequences. Running 19 miles west and north from downtown Providence to North Smithfield, in 1998 President Bill Clinton designated the "Woony" - as it's locally known - as one of 14 American Heritage Rivers for its role in the textile and manufacturing industries of the 19th century.

According to the Woonasquatucket River Watershed Council (WRWC), the organization tasked with championing the restoration and preservation of the river, the concept of a greenway along the Woony began in 1993. Then, Fred Lippitt, Chair of The Providence Plan, looked for an opportunity to spark the revitalization of adjacent Olneyville – the poorest, most underserved neighborhood in Providence (WRWC, nd).


Over the next 25 years, using a combination of federal and locally leveraged funds, the WRWC completed 5.7 miles of riverside bicycle and pedestrian paths, restored four parks including one with a bike shop and summer camp, and hosts a wide range of environmental programming in the community.

Similar to the Mystic Greenways, the Woony paths run alongside a busy, often-congested highway – Route 6 in Providence – and travels through traditionally marginalized communities. Unlike I-93, Route 6 is not an elevated highway nor does it share the Mystic's unfortunate wind patterns. Thus, it doesn't produce the same air pollution concerns, although highway noise is still present on the path.

Nicole Vance, Greenway Program Director, explained that unlike MyRWA, WRWC views the highway "as an asset and not a barrier" because of a retaining wall mural that advertises the adjacent Greenway to people driving by or stuck in traffic. "A lot of people don't realize that this fabulous greenway runs through this part of the city," she said in a phone interview.

Most of WRWC's current greenway work is focusing on expanding the paths further into downtown Providence as well as increasing their visibility and access. Like the Mystic and I-93, in Providence I-95 bisects the city, making walking and biking from one side to the other difficult. According to Vance, WRWC "has our fingers in as many pies as possible" working with all levels of government and diverse stakeholders to improve access to the river, especially in the connector area of Olneyville Square. There, a complete redesign process for the chaotic five-way intersection is underway – which will hopefully result in a more welcoming environment for pedestrians and bicyclists.

Vance says that identifying and improving these "gateways" to the Greenway – including Olneyville Square – is a key step to getting more people to the river and its paths. "We are working on bringing in gateway and wayfinding signage so that it is a branded, character-driven, recognizable thing. So that when you approach from a distance you can tell "Hey, there's the Greenway, and I'm gonna get on it."

these walls provide a blank canvas for local artists to showcase their talent and provide travellers with a taste of the local culture, as was done in Providence. Conversely, a more attractive option would be a clear/ transparent wall. This would allow passersby to view the river and greenways, but would cost significantly more. Clear or transparent sound walls are ten to twenty times more expensive than their concrete counterparts.[3]

In addition to transparent and concrete sound walls there are other materials as well that have a more middling cost. The different types and their efficiency can be found in the table above.[4] Although I-93 is a raised highway, this does not limit the types of available designs – there are many ways to retrofit this section to allow for the addition of a sound wall.[5]

## POLLUTION ADVISORY SIGNAGE

**ADDRESSES:** Health

**BENEFITS:** If the cost of a concrete sound wall, the least expensive sound wall option, is even found to be too expensive, signage could prove to be a more economical option. To ensure that the signage does not completely deter people from using the greenway there could be two different signs employed to inform users of the pollution without deterring their presence.

The first sign would be permanent, and would point out the ambient noise caused by I-93. The sign would then segue into explaining the reduction in noise the wall would provide and allude to the benefits air pollution mitigation benefits. To learn more about the sound wall and how to advocate for it there could also be a QR code that would lead to a website with more information.

The second sign could be a temporary fixture that was only placed along the paths during the winter. This sign would warn greenway users of the elevated air pollution levels during the winter at morning rush and encourage users of the trails near I-93 to seek alternate routes. By placing the sign only during the winter, the signs would be more likely to target regular greenway users, who likely would not permanently change their behavior.

**COST:** $500-2000

**RECOMMENDED LOCATION:** Near trail located within 200M of I-93

**EVIDENCE:** According to our expert interviews, visitors have a right to be informed of the potential health risks and allowed to use the park at their own discretion.


Figure 26. Renderings Of Advisory Pollution Signage.

## INTERSECTION IMPROVEMENTS

**ADDRESSES:** Access and Activation

**BENEFITS:** According to the USDOT, 40% of all motor vehicle crashes occur in intersections[6]. The sheer quantity of turning movements, signals, signs, and different modes of transportation interacting with each other make intersections dangerous places, especially vulnerable road users like bicyclists, pedestrians, and wheelchair users.

Many of the roads surrounding the Mystic River are stuck in the 20th century, auto-dominant paradigm. It is time that they are upgraded and improved for modern safety standards, and for a sustainable future in which private car ownership is not the dominant transportation choice.

**COST**: Interventions for roadway improvements vary widely depending on the level of commitment to vulnerable road user safety and the necessary retrofits. Sidewalks and paths generally cost $10/sq foot, a refuge island can be between $14,000-$16,000, and a painted bike box is $5,000. For a complete breakdown of costs for safe street interventions, see Appendix F.

**EVIDENCE:** All of the existing plans we analyzed called for roadway improvements and better, safer access for walking and biking to the Mystic. The research methods we employed including the survey, problem spots map, and route audits further support these changes.

**LOCATIONS:** We recommend improving the following intersections:

| INTERSECTION | LOCATION | NEEDS |
|---|---|---|
| 1. Harvard Street/Route 16 @ Mystic Ave AND I-93 | Medford | • Protected bike lanes and bike boxes<br>• Curb bump-outs and shorter crossing distances for pedestrians<br>• Leading pedestrian interveral (LPI) signal timing |
| 2. Winthrop Rotary | Medford | • Narrower travel lanes for speed reduction<br>• Curb bump-outs and shorter crossing distances for pedestrians<br>• Depending on road width, dedicated bike lanes or sharrows + "bicycles may use full lane" signs |
| 3. Temple Street & Mystic Ave | Somerville | • Dedicated bike lanes and bike boxes at the intersection<br>• Curb bump-outs and shorter crossing distances for pedestrians, re-painted crosswalks<br>• LPI signal<br>• Infraspace improvement in underpass (see INFRASPACE section) |
| 4. Shore Drive & Mystic Ave. | Somerville | • Removal of on-street parking in the underpass and on Shore Drive would allow space for bike lanes<br>• Wider sidewalks |


Crosswalks Along Busy Mystic Ave, Right In Front Of The High Density Housing Complex Mystic Towers, Are Severely Degraded. Photo: Liza Burkin.

| | | |
|---|---|---|
| 5. Wellington Circle | Medford | • Shorter signal timing for pedestrians, curb bump-outs for shorter crossing distances, more prominent crosswalks<br>• Protected bike lanes<br>• OR entirely elevated crossing for all vulnerable road users (see ELEVATED CONNECTIONS section) |
| 6. Main Street & Mystic Ave | Medford | • Protected bike lanes<br>• Wider sidewalks<br>• Shorter crossing distances and more prominently painted crosswalks |
| 7. Kensington Underpass | Somerville | • Infraspace improvements (see INFRA-SPACE section) |
| 8. Grand Union Boulevard & Mystic Ave/I-93 | | • Painted bike lanes and boxes<br>• Wider sidewalks, shorter crossing distances, prominently painted crosswalks<br>• Infraspace improvements (see INFRA-SPACE section) |
| 9. Sullivan Square | Boston | (currently under construction)<br>• Protected bike lanes<br>• New sidewalks, wider existing sidewalks, shorter crossing signals, prominent crosswalks<br>• OR elevated bicycle/pedestrian crossing (see ELEVATED CONNECTIONS section) |
| 10. Santilli Circle | Everett | (currently under construction)<br>Protected bike lanes<br>• New sidewalks, wider existing sidewalks, shorter crossing signals, prominent crosswalks |

# RENDERINGS OF INTERSECTION IMPROVEMENTS

Figure 27. Recommendations For Harvard Street/Route 16 @ Mystic Ave And I-93

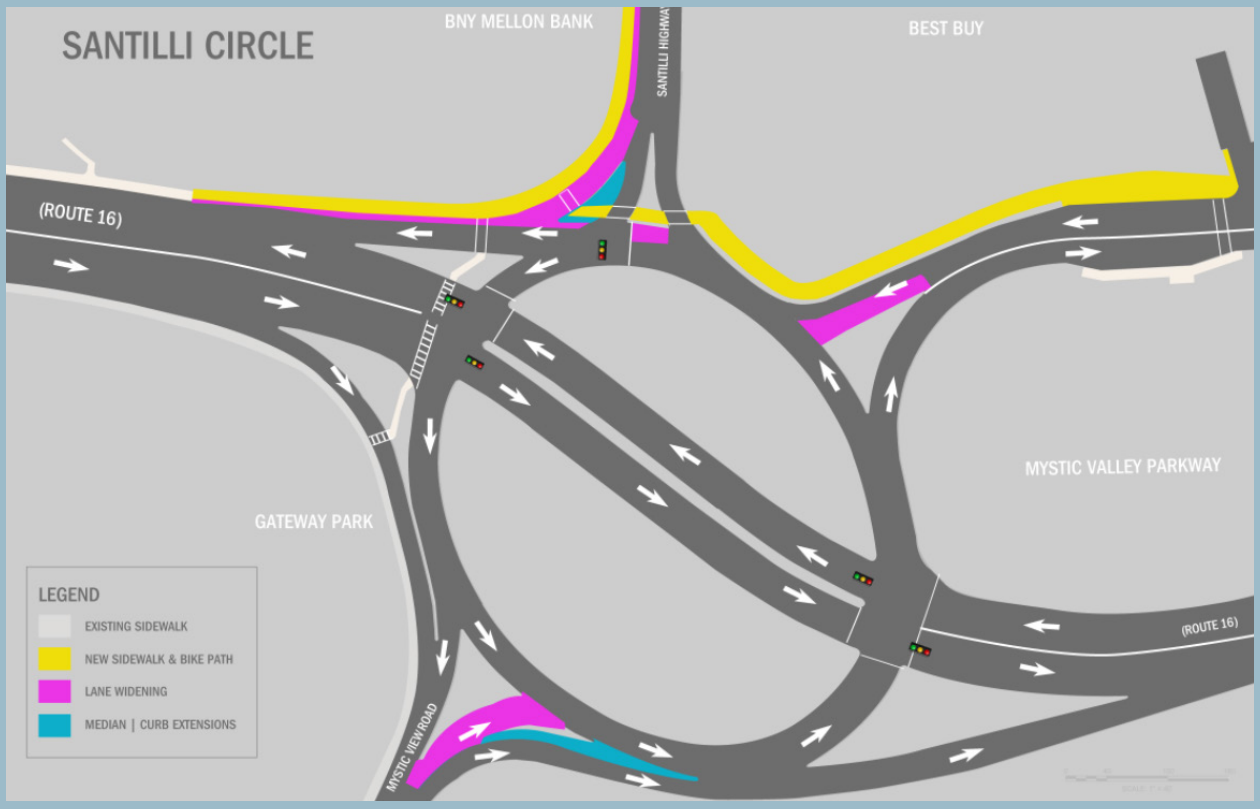


Figure 28. Recommendations For Santilli Circle From Wynn For All

# ELEVATED BICYCLE AND PEDESTRIAN CONNECTIONS

**ADDRESSES:** Access and Activation

**BENEFITS:** Safely transports people over high-traffic, high-volume roadways where traffic calming and biking/walking infrastructure is not recommended in the right-of-way.

**EVIDENCE:** Safe and comfortable active transportation is all about motor vehicle speed reduction – a welcome change on many city and residential streets. But our secondary research revealed that for a high-volume arterial road like Mystic Valley Parkway/Route 16, high speeds are crucial for economic efficiency for the region. This essentially negates the possibility of safe bicycle and pedestrian infrastructure in or alongside the right-of-way, and requires complete separation from motor vehicles. Around Boston and the world, elevated bicycle and pedestrian connections are used to safely transport people over highways.

The City of Boston has successfully implemented footbridges over Storrow Drive and the Mass Pike. Harvard is currently designing and funding two more footbridges over Soldier's Field Road in Allston[7].

It is time for the Cities of Medford and Somerville, with help from MassDOT and USDOT, to do the same over Mystic Valley Parkway and I-93.

In 2012 in the Netherlands, the world's first elevated bicycle and pedestrian roundabout – called the Hovenring – was built over a high-speed intersection. This kind of innovative, world-class infrastructure would be the perfect solution for Greater Boston's messy, multi-lane intersections like Wellington Circle, Sullivan Square, and Santilli Circle.

**COST:**

- The construction cost of the Hovenring was $6.3 million euros.[8]
- The cost of the two planned footbridges over Soldier's Field Rd in Allston is $3.5 million.

**RECOMMENDED LOCATIONS:**

- Footbridges: Mystic Valley Parkway, Mystic Ave, I-93
- Elevated roundabouts: Wellington Circle, Sullivan Square, Santilli Circle

# EXAMPLES OF ELEVATED ACTIVE TRANSPORTATION INFRASTRUCTURE

The Hovenring In Eindhoven, Netherlands. Photo: Ipv Delft.

View Over Franklin Footbridge, Allston, Ma; Image Courtesy Of The Chroma Line.


Footbridge Over Storrow Drive, Boston. Photo: Mark Garfinkel

## INFRASPACE IMPROVEMENTS

**ADDRESSES:** Access and Activation

**BENEFITS:** In 2014, MassDOT announced a "Request for Information, or RFI" for the creation of their "Infra-Space" Program to "identify areas under elevated roads, bridges or viaducts for possible redevelopment opportunities."[9] The first place in the region to undergo an infraspace transformation was the new Ink Underground park underneath I-93 between the South End and Southie neighborhoods, which opened to much fanfare in September 2018[10].

The park now features ample public art, exercise areas, green space, a dog park, and a potential craft beer garden. This is exactly the kind of dynamic public placemaking Somerville needs to increase access and activation underneath I-93, just north of Boston.

**COST**: MassDOT spent $8.5 million on the Ink Underground park in South Boston

**RECOMMENDED LOCATIONS:**

- I-93 @ Temple Street
- Kensington Underpass (Kensington Ave @ I-93)
- Grand Union Boulevard @ Mystic Ave

Murals Along The New Ink Underground Infrspace Park In Boston. Photo: Walkboston.

# EXAMPLES OF INFRASPACE IMPROVEMENTS

Figure 29. Infraspace Rendering. Photo: Massdot

Photo: Landing-Studio.com

## WAYFINDING

**ADDRESSES:** Access and Activation

**BENEFITS:** Understanding of general direction (i.e. how to get to the river, park, downtown area), cultural and historical context (knowing the significance of the Mystic River Watershed, the communities of Somerville and Medford)

**COST:** Between $500-$2,000 per sign

**RECOMMENDED LOCATIONS:** Prominent street intersections that lead to the parks, as well as at the parks themselves

**EXAMPLES:**


Photo: Indianapolis Cultural Trail


Photo: Ohio River Trail.


Photo: Sydney Cycleways

## IMPROVED AMENITIES

**ADDRESSES**: Activation

**BENEFITS:**

- Playgrounds - provides active recreation space for children
- Amphitheater - location for local organizations or musicians to host concerts or performances
- Picnic tables - encourage residents to spend a day and have lunch at the park, it would create a place for them to sit and relax with those in their company rather than just pass through on foot or bike
- Drinking fountains & Restrooms - If you want to create a space where people can spend the whole day, you need an easily accessible restroom. Water is also necessary for all individuals to stay hydrated, whether they are running/ walking, playing on a playground, or want to refill their water bottle that they brought with their picnic lunch

**COST:** Varies

**RECOMMENDED LOCATIONS:** More than 200M away from I-93

**EVIDENCE:** The community input generated by both the survey responses and participation in the Blessing of the Bay public meeting heavily influenced the recommendations for activation.

Survey respondents directly expressed the desire for more recreational structures throughout the parks - such as playgrounds and amphitheaters. The image below displays a natural playground was chosen versus a traditional play structure, as it combines the natural elements of the park such as woodchips, shrubbery, and grass, with manmade play structures. It is a more subtle yet aesthetic option that creates fun for all ages as they are more physically open, rather than a built structure that can feel constricting to older adolescents and adults.

Photo: Earthscape Custom Playgrounds

## PROGRAMMING

**ADDRESSES**: Activation

**BENEFITS:** Bringing community members together to enjoy shared experiences in a common space, allowing local organizations to self-promote and engage the community in cultural/historical events (i.e. through public art, pop-up shops, festivals)

**COST**: Varies

**RECOMMENDATIONS**: Seasonal events at the parks

- Autumn: fall festivals with activities including pumpkin carving, bobbing for apples, a donut and cider tent
- Winter: a skating rink, ice sculptures on display
- Spring: outdoor concerts, drama performances by local theater groups
- Summer: movie nights at sundown, food festivals

**EVIDENCE:** Community members who participated in the public meeting to redesign Blessing of the Bay suggested the implementation of more park programming, versus permanent structures. They pitched various seasonal ideas, including festivals and showcases put on by local organizations. Such an idea has has been enacted in the city of Newark, New Jersey. Every June, the city hosts a "Walk to the Water Event," (photo below) in which a local marching band leads residents from Newark City Hall to the Newark Riverfront Park along the Passaic River, where events are held all afternoon[11]. If local organizations throughout Somerville and Medford can emulate this event in a similar fashion, it would allow for community members to engage more with the Mystic River parks.

Photo: The Urban Prospector

# FUNDING

Whether it's a sound/pollution wall along I-93, footbridges over Mystic Valley Parkway, or park amenities at Blessing of the Bay, improvements in access, health, and activation of the Mystic River Greenways all require one thing: money. Generally, public funding requires legislation.

Our current political and economic landscape presents an ironic challenge: government spending is steadily decreasing at the same time the lifespan of our infrastructure is coming to an end. Roads, bridges, airports, dams, and water systems nationwide are deteriorating – while demand to live in cities such as Somerville, Medford, and Everett is skyrocketing.

In generations past, a large portion of the funds for infrastructure repairs, retrofits, and upgrades necessary to revive and restore the Mystic River and its surrounding communities might have come from the federal government. Interstate 93 is a federally-owned road, and mitigating its harmful effects should likewise come from federal coffers. However, in today's political climate, that doesn't seem likely. In February 2018, President Trump unveiled a plan to stimulate $1.5 trillion in spending on infrastructure – but with only $200 billion (less than 1%) coming from direct federal spending[12]. This is not a way forward.

In direct response to this spending climate, Massachusetts lawmakers are thinking about ways to fund vital projects and programs ranging from transportation to education to affordable housing to climate change resiliency. Below we will describe a few of the relevant proposed funding mechanisms that would directly benefit the Mystic River, its greenways, and neighbors.

## FAIR SHARE AMENDMENT

*"Right now, our transportation network is stuck in the last century. For Massachusetts to compete against other regions around the nation and the globe, we need to invest in modern, reliable transportation: safer roads and bridges, public transportation that riders can count on, and safe ways to walk and bike around town."*

*~ Raise Up Massachusetts[13]*

The Fair Share Amendment, also known as the Millionaire's Tax, is a proposed ballot measure that would amend the Massachusetts Constitution to allow income to be taxed progressively instead of uniformly. Currently, all state income is taxed at 5.1%. The Fair Share Amendment would increase that rate by 4% for any Massachusetts income above $1 million, resulting in a 9.1% tax.[14]

This is projected to raise $2 billion for the state budget, and the additional tax revenue would be earmarked specifically for public education and transportation. Currently, the Massachusetts Supreme Judicial Court is debating the constitutionality of this change, and whether or not in can appear on the November 2018 ballot.

## CONGESTION PRICING

*"Economists and transportation experts will tell you there's only one proven policy that reduces traffic congestion. The only question is whether the public has the palate for it. In Boston, the question is particularly pressing."*

*~ Nik DeCosta-Klipa, Boston.com[15]*

Traffic congestion and the auto-dominant paradigm is at the heart of the issue in the Mystic River corridor. While dangerous air pollutants are always emitted from vehicles, they are worst during stop-and-go traffic.[16] Congestion pricing is a flexible

funding mechanism by which motorists can be charged for driving on certain roads during peak times, or for entering certain "congestion zones", or for using specific high-speed lanes.

Congestion pricing schemes have been implemented and are highly successful in London, Stockholm, Singapore, Milan, and most recently Washington D.C. Conversations about it are ongoing in New York City. Typically unpopular at the outset, congestion pricing schemes require bold leadership to initiate. However, the results speak for themselves – residents of cities with this policy have accepted it due to massive traffic reductions in previously choked urban centers.[17]

Furthermore, the revenue raised is used to repair and maintain roads and bridges, as well as invest in public and active transportation projects. For the Mystic River Greenways and surrounding feeder routes, congestion pricing could be one highly effective revenue stream for making big changes.

Currently, Boston is just beginning to have conversations about congestion pricing in the media and amongst transportation advocates.

## CARBON TAX

Another way to create revenue for transportation and infrastructure projects like those required to improve the Mystic River Greenways is by raising the long-stagnant gas tax. The federal excise tax on gasoline is 18.4 cents per gallon and has not been raised since 1993 – despite the transportation sector being the single biggest contributor to greenhouse gas emissions and climate change.[18] Many states and communities are working to change this, including Massachusetts.

A state carbon tax would demand a fee from both carbon producers (oil and gas suppliers) and consumers (drivers) – giving a strong incentive to switch to cleaner energy sources while raising funds for renewable energy and transportation infrastructure projects.

According to local nonprofit Climate XChange, there are currently three key bills in the Massachusetts legislature that focus on putting a fee on carbon pollution. The bills have collectively received 79 cosponsors – more than one third of the legislature.[19]

The bill most relevant to the Mystic River Greenways challenge is H1726, An Act to Promote Green Infrastructure, Reduce Greenhouse Gas Emissions, and Create Jobs, sponsored by Representative Jennifer Benson. If passed, this bill would return 80% of the revenue collected via rebates to households and employers, while 20% would be used to fund green infrastructure investments in transportation, clean energy, and protection against the impacts of climate change.

## MA HOUSE BILL H.4018 / MA SENATE BILL S.2279

*"As the new State Representative for East Somerville, I am particularly focused on the need to mitigate the impact of air pollution from Interstate 93," Connolly said in a statement. "That's why I'm proud to announce the adoption of this amendment to create a funding opportunity to help address I-93 pollution, and I want to express my thanks to my Somerville House colleagues Rep. Provost and Rep. Barber, as well as the entire membership for supporting me with this district priority."*

*~ State Representative Mike Connolly, in Patch.com*[20]

These twin bills, named "Acts providing for capital facility repairs and improvements for the Commonwealth," were put forth by

the House and Senate Ways and Means committees in November 2017. Totaling more than $3.5 billion, the bills fund the immediate capital improvement needs of the Commonwealth, including costs associated with planning and studies, acquisition of land and buildings, repairs, construction, renovation, demolition, and other forms of managing state-owned property.[21]

Middlesex 26th District State Representative Mike Connolly, who represents Mystic River bordering neighborhoods of East Somerville and Assembly Square, filed amendment to the House bill which secured $500,000 in bond funds to address I-93 air pollution in the city. The amendment was filed by Connolly and co-sponsored by Reps. Denise Provost and Christine Barber, both of Somerville. Connolly also secured $65,000 in the 2018 state budget to address I-93 pollution.

## PRIVATE FUNDING: PUBLIC-PRIVATE PARTNERSHIPS

*"Wynn is spending more than $264 million in private funds to upgrade area roads in Boston, Everett, Medford, Revere and Chelsea and to help reduce traffic congestion in the region. No public or taxpayer funds are being used to finance any of this work."*

*~ Wynn for All*[22]

Currently, one of the most popular ways to fund public infrastructure projects in Greater Boston is to get private developers to pay. Whether it's the $38 million Harvard Allston Partnership Fund[23], the ongoing community benefits negotiation in Union Square in Somerville[24] or the $840 million in mitigation payments from the Everett Casino[25], Greater Boston residents are fully awake to the fact that if developers want to make sky-high profits in their communities, they have to give something back.

Right on the Mystic River, the owners of the Everett casino (at the time of this writing still Wynn Resorts Ltd., which may change due to a sexual misconduct scandal) are spending $264 of the $840 million in community benefits specifically on transportation projects.[26] Many of these projects are already underway at the time of this writing, including roadway improvement work on Sullivan Square, Route 16, and Alford Street/ Broadway.

According to Wynn for All, a website describing the roadway improvements and providing constant construction updates, $58 million will be spent on road and traffic improvements along a one-mile stretch the project is calling the "Mystic Mile." The Mystic Mile contains five key intersections:

1. Sullivan Square, Boston
2. Santilli Circle, Everett
3. Sweetser Circle, Everett
4. Rt. 99/Broadway, Everett
5. Wellington Circle, Medford

As part of the casino's attempt to mitigate regional traffic caused by tens of thousands of new resort-goers, each of these notoriously dangerous intersections will receive upgrades and treatments that will improve the safety, comfort, and convenience of walking, bicycling, and taking transit.

Wynn for All's spending also includes improvements to the Wellington and Malden MBTA stations, ferries from downtown Boston, and payments to the MBTA to subsidize Orange Line operations. While the casino has paid $250,000 to DCR for a study and 25% design plan of a bicycle and pedestrian bridge from the resort to Assembly Row, they have not committed the necessary $23 million to actually build it.[27]

# CONCLUSION: IT'S TIME TO ACT

As evidenced by our analysis of existing plans and projects, the challenges addressed in this report have been studied at length – but few recommendations from these plans have actually been implemented. By bringing together the most critical needs expressed in this body of past work – and demonstrating the need to address pollution concerns - we hope that the holistic nature of this report will prove valuable to MyRWA and other community members as they continue to advocate for this worthy regional project.

We also hope that the range of recommendations offered here demonstrate the variety of opportunities for growth throughout the Mid-Mystic Loop and its surrounding connections. From significant infrastructure investments to low-cost tactical urbanism projects, there are many ways in which we can create a vibrant and healthy community space that is accessible for all, including the environmental justice communities residing along the Mystic.

This is the opportune moment to ensure that the Mystic River and its greenways do not continue to get overlooked as Metro Boston prepares for significant development and population growth.

**After a decade of planning, the time to act is now.**

Endnotes


1. Somerville Transportation Equity Partnership and Metropolitan Area Planning Council, “I-93 Sound Walls: Health Impact Assessment Scoping Session.”
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4. Kuennen, "Sound (wall) Advice."
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8. ipv Delft, "Hovenring Eindhoven."
9. MassDot Blog, "MassDot InfraSpace Program Seeks Ideas."
10. Logan, "Boston gets an artsy space in a former no-man's land."
11. Rich, "Newark Walks to the Water & River Day."
12. Wagner and Long, “Trump’s big infrastructure plan has a lot of detail on everything but how to pay for it.”
13. Raise Up Massachusetts. “Fair Share Amendment.”
14. Jacoby, “SCJ should spike proposed millionaire’s tax.”
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16. Wig Zamore, Interview.
17. Jaffe, “Traffic Jams, Solved.”
18. Climate Xchange, “Why Carbon Pricing?”
19. Ibid
20. Newman, “MA House Adopts Amendment To Reduce I-93 Pollution In Somerville.”
21. The 190th General Court of the Commonwealth of Massachusetts, “Bill H.4018.”
22. Wynn for All, “About.”
23. Rocheleau, “Harvard offers $38 million in community benefits to Allston.”
24. Union Square Neighbors, “Union Square Land Use and Community Benefits.”
25. Wynn Boston Harbor, “Section 61 Presentation.”
26. Wynn for All, “About.”
27. Vacarro, “Who will pay for a $23 million footbridge to the Wynn casino?”

# 9 APPENDIX

# APPENDIX A: SURVEY QUESTIONS (ONLINE AND PRINT)

## MYSTIC RIVER GREENWAYS SURVEY (ENGLISH)

### PARTICIPANT INFORMATION SHEET

What the study is about:
The purpose of this study is to learn about the demographics of people who use the parks and trails along the Mystic River (collectively known as the Mystic River Greenway), the public's level of interaction with said parks and trails, and the route people take to get to the Mystic River.

What we will ask you to do: If you agree to be in this study, we ask you fill out the following survey, which contains questions about demographic information, greenway activities, and travel habits.

Additionally there will an optional activity at the end of this survey. In this activity we ask that you upload pictures of problematic spots along your commute to or near the Mystic River. Pictures should be of streetscapes that make your commute less pleasant. This activity, and by extension the photos uploaded to the site, will be made visible to the public. Do NOT upload any photographs that contain identifying information to you, or others. This activity will help us understand how to improve routes to the Mystic River.

YOU MUST BE 18 OR OLDER TO PARTICIPATE IN THIS SURVEY

Risks and benefits:
There are minimal risks to participating in the survey. There are no benefits to you. However we hope to use the information from this study to improve the Mystic River Greenways for the public's benefit.

Compensation:
There will be no compensation for this study

Your answers will be confidential. The records of this study will be kept private. In any sort of report we make public, will not include any information that will make it possible to identify you.

Taking part is voluntary: Taking part in this study is completely voluntary. You may skip any questions that you do not want to answer. If you decide not to take part or to skip some of the questions, it will not affect your current or future relationship with Tufts University or the Mystic River Watershed Association. If you decide to take part, you are free to withdraw at any time.

If you have questions: The researchers conducting this study are Liza Burkin, Carolyn Meklenburg, Marissa Meaney, and Kelly Sherman. If you have questions, you may contact Kelly Sherman at kelly.sherman@tufts.edu. If you have any questions or concerns regarding your rights as a subject in this study, you may contact Lara Sloboda, Operations Manager of the Institutional Review Board (IRB) at (617) 627-3276 or access their website at http://viceprovost.tufts.edu/sberirb/.

Part 1:
Where do you live?

- Somerville
- Medford
- Everett
- Chelsea
- Boston
- Malden
- Cambridge
- Arlington
- Winchester
- Other _____

Please enter zip code._____

About how far do you LIVE from the Mystic River?

- about a quarter of a mile or closer
- about .25 miles to .5 miles
- about .5 miles to 1 mile
- about 1 mile to 3 miles
- about 3 miles or more
- I don't know
- N/A

About how far do you WORK from the Mystic River?

- about a quarter of a mile or closer
- about .25 miles to .5 miles
- about .5 miles to 1 mile
- about 1 mile to 3 miles
- about 3 miles or more
- I don't know
- N/A

What's your primary mode of daily transportation?

- Car
- Public transportation (T, bus, commuter rail)
- Bicycle
- Walking
- Wheelchair
- Some combination (i.e. biking to the T)
- Other _____

Part 2:
Do you interact with the river?

- Yes (i.e. walk or run for recreation or daily transportation along or across the river; visit to hang out and relax)
- No (but I would like to; I didn't know there were parks there; I don't want or need to, I have other places to be outside) Skip to Section 4

Part 3: Yes, I interact with the river.
How do you use the river and its parks? Check all that apply.

- Walk/ run/ bike/ roll for fun and exercise
- Walk/ run/ bike/ roll for fun and transportation
- Boat
- Fish
- Relax
- Socialize with picnic
- Play with children
- View nature/wildlife
- Play sports
- Other_____

What would improve your experience with the Mystic River?

_____
_____
_____
_____
_____
_____

What are the streets, intersections, or other barriers that make it hard for you to bike to, along, or across the Mystic River? For example: Intersection of Broadway and Route 28, or Mystic River Parkway"

_____
_____
_____
_____
_____

Part 4: No, I don't interact with the river.
Why don't you interact with the Mystic River and its parks and walking/biking path? Check all that apply:

- I-93 is too loud to make spending time at the park enjoyable.
- I didn't know there were parks and walking/biking paths there.
- It's too hard/ unsafe for me to bike and walk there.
- It's too hard to park my car there.
- I just have no interest in spending time there.
- Other _____

What would improve your experience with the Mystic River?

_____
_____
_____
_____
_____

Part 5: Demographics
What is your race?

- White
- Black or African American
- Asian
- Native American
- Pacific Islander
- Other _____

What is your ethnicity?

- Hispanic
- Non-Hispanic

What is your gender?

- Female
- Male
- Gender Non-conforming
- Other

What is your yearly average income?

- Less than $25,000
- $25,000 - $34,999
- $35,000 - $49,999
- $50,000 - $74,999
- $75,000 - $99,999
- $100,000 - $149,999
- $150,000 - $199,999
- $200,000 or more
- I'd prefer not to say.
- Other _____

What is the primary language spoken in your household?_____

Part 6:Contact Information

Would you like to be contacted to further talk about your experiences with the Mystic River? (If yes, please leave your preferred contact information. Thank you!)

_____

Thank you for taking our survey!

Want to get even more involved in the planning process? Go to https://tuftsgis.maps.arcgis.com/apps/StoryMapCrowdsource/index.html?appid=ffa0591561e9409685066b1c1c4e1dce to participate in our collaborative map of biking and walking "problem spots" near the River. Next time you're out for a walk or bike ride, snap a photo of a place that needs improvement and share it on the map! No sign-in necessary, just click the "Participate" button on the top right to get started, and select "Continue as Guest." Please Do NOT upload any photographs that contain identifying information to you, or others. Thanks!

# APPENDIX B: INTERVIEW LIST AND QUESTIONS

## INTERVIEWEE LIST

- **DR. DOUG BRUGGE**, Professor of Public Health and Community Medicine, Tufts University
- **MR. WIG ZAMORE,** Somerville Transportation Equity Partnership
- **MS. ERICA WALKER,** PhD Researcher at Harvard University, Founder of Noise and the City
- **STATE REPRESENTATIVE MICHAEL CONNOLLY**, Middlesex 26th District
- **MS. TERESA VASQUEZ-DODERO,** Executive Director, East Somerville Main Streets
- **MS. SHARON RON**, Public Health Research Analyst, Metropolitan Area Planning Council (MAPC)
- **MR. JONAH GARNICK**, Greenways Coordinator, Bronx River Alliance
- **MR. JEFF BUXBAUM**, Medford community member
- **MS. NICOLE VANCE**, Greenway Program Director, Woonasquatucket River Watershed Council
- **MS. JANE CALVIN,** Executive Director, Lowell Parks & Conservation Trust
- **MS. ALICIA HUNT**, Director of Office of Energy & Environment, City of Medford
- **MS. ALLIE FISKE**, Business and Cultural Liason, Mayor's Office, City of Medford

## INTERVIEW INFORMATION SHEET

What the study is about:
The purpose of this study is to learn about the community's and expert's opinions on the challenges the Mystic Greenways presently face, and some of the ways the Mystic River Greenway, and other greenways positively impact the community.
What we will ask you to do: If you agree to be in this study, we will ask you to answer some questions over interview regarding the Mystic River Greenway, to help us shape our future research, and also ask for your professional opinion of the greenway and it's challenges. With your permission, I will audiotape the interview for the purposes of accurately transcribing the conversation. Additionally with your permission I may use parts of your responses in our written report/ presentation. If we use your response I will contact you and allow you to see and edit this section of the report before it is shared with the public.

Risks and benefits:
There are minimal risks to participating in the interview. There are no benefits to you. However we hope to use the information from this study to improve the Mystic River Greenways for the public's benefit.

Compensation: There will be no compensation for this study

Taking part is voluntary: Taking part in this interview is completely voluntary. You may skip any questions that you do not wish to answer. If you decide not to take part or to skip some of the questions, it will not affect your current or future relationship with Tufts University or the Mystic River Watershed Association. If you decide to take part, you are free to withdraw at any time.

If you have questions: The researchers conducting this study are Liza Burkin, Carolyn Meklenburg, Marissa Meaney, and Kelly Sherman. Please ask any questions you have now. If you have questions later, you may contact Kelly Sherman at kelly.sherman@tufts.edu. If you have any questions or concerns regarding your rights as a subject in this study, you may contact Lara Sloboda, Operations Manager of the Institutional Review Board (IRB) at (617) 627-3276 or access their website at http://viceprovost.tufts.edu/sberirb/.

## INTERVIEW QUESTIONS

Interviews will be categorized into three different groups; case study, community and government. Each different type of interview will have different questions associated with it, but within each category the questions will be the same.

### CASE STUDY

- What have been your biggest challenges in advocating for your greenway?
- What are the specific benefits that you see your greenway brings to the community? Any particular anecdotes?
- If applicable, how have you dealt with proximity to a main highway, and resulting problems with air pollution/ noise pollution?
- If applicable, how have you improved community access to your greenway?

### COMMUNITY

- What role do you think the Mystic River plays in your constituency right now?
- I know you're already involved in some initiatives to increase connectivity and access, can you tell me a bit about those efforts?
- How do you think that an investment in the parks and trails around the Mystic River would benefit your constituency?
- Where do improvements to the Mystic River Greenway fall in your priorities? What are the obstacles you face in making it more of a priority?

### GOVERNMENT

- What role do you think the Mystic River plays in your constituency right now?
- I know you're already involved in some initiatives to increase connectivity and access, can you tell me a bit about those efforts?
- How do you think that an investment in the parks and trails around the Mystic River would benefit your constituency?
- Where do improvements to the Mystic River Greenway fall in your priorities? What are the obstacles you face in making it more of a priority?
- Do you have any immediate or future plans to work on the Mystic River Greenway?

# APPENDIX C: DETAILED CURRENT INITIATIVES MATRIX

| NAME | TOPIC | CATEGORY | DESCRIPTION |
|---|---|---|---|
| Bill H.4018 "An Act Providing for Capital Facility Repairs and Improvements for the Commonwealth" |  | Legislative / State | Adoption of an amendment by State Representative Mike Connolly for the City of Somerville to secure $500,000 in bond funds to help mitigate I-93 air pollution on Somerville. |
| Bill S.2279 "An Act Providing for Capital Facility Repairs and Improvements for the Commonwealth" |  | Legislative / State | This 2018 bill proposed the allocation of $10,000,000 to the City of Medford in order to construct a public safety complex. |
| Boston Cyclists Union |  | Community / Advocacy | Helping Bostonians lead healthier lives by promoting the everyday use of the bicycle for transportation. |
| City of Somerville: Blessing of the Bay and Draw 7 Park Revitalization and Redesign |  | Municipal | Complete redesign of the two parks in order to protect the riverfront, link the greenways, and provide opportunities for social interaction. |
| Community Assessment of Freeway Exposure and Health (CAFEH Study, Tufts University) |  | Academic | Combines community and academic resources to advance scientific understanding of the health risks of highway pollution. |
| DCR Bicycle and Pedestrian Mystic River Crossing |  | Legislative / State | The purpose of this project is to provide the missing link in the regional greenway network; reduce traffic by providing pedestrian and bicycle access; and provide Everett with access to the MBTA at Assembly Station. |
| DCR: Blessing of the Bay and Draw 7 Park Revitalization and Redesign |  | Legislative / State | Goals of this project are to improve the fishing dock area; evaluate the potential of a conceptually proposed music venue; ensure adequate security and protection of DCR's Amelia Earhart Dam; link the Mystic River Greenway paths; restore the river edge condition; provide opportunities for social gatherings; incorporate native landscape plantings and park furnishings. |

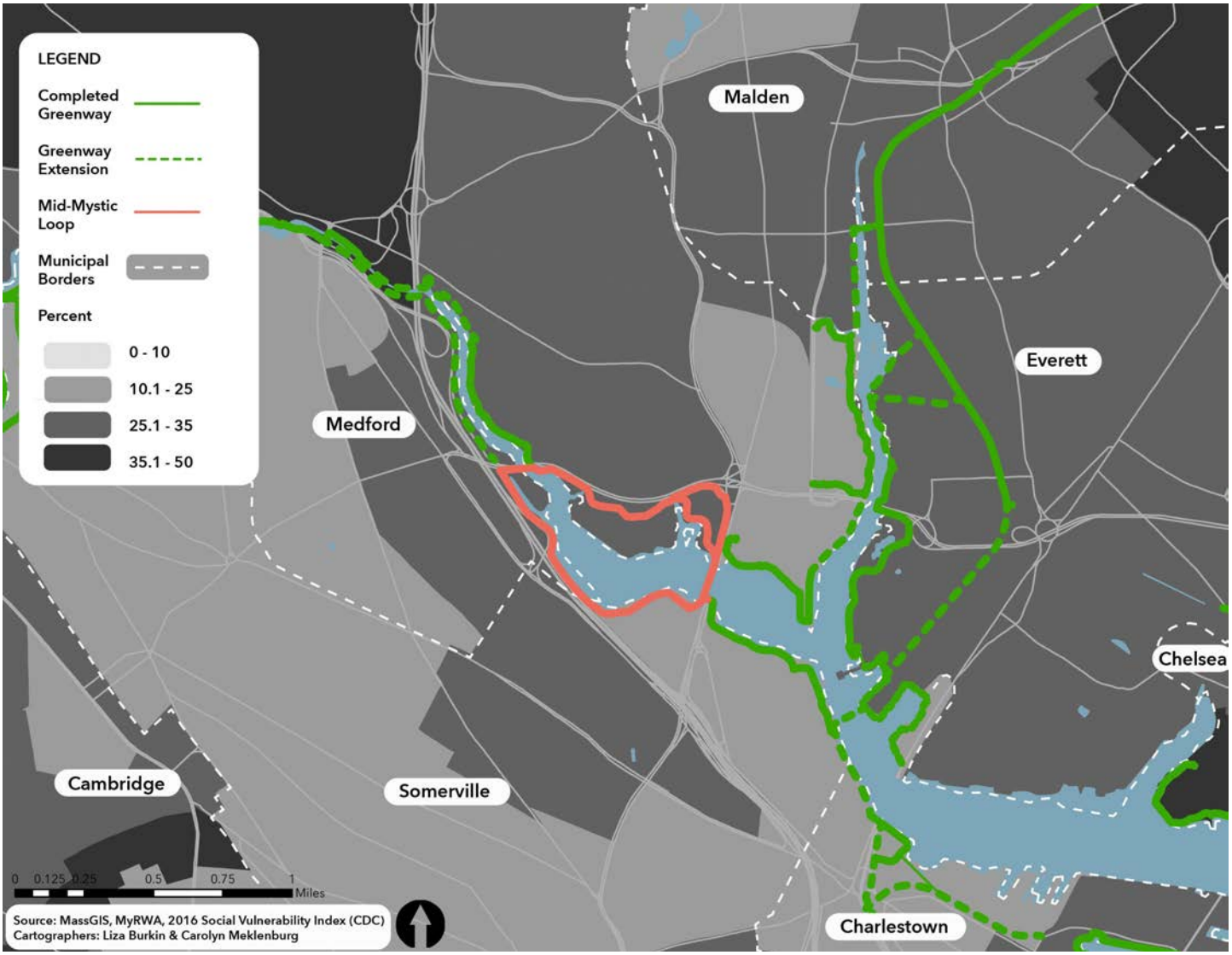
| NAME | TOPIC | CATEGORY | DESCRIPTION |
|---|---|---|---|
| East Somerville Main Streets |  | Community / Advocacy | The mission of this local organization is to improve the life of the community by building investment, connection, and pride in the main streets. This is done by strengthening and promoting the role of the East Broadway Business District as a commercial and cultural center, and enhancing social connectedness within the neighborhood. |
| Fair Share Amendment (2018 Ballot Measure) |  | Legislative / State | This measure, if passed, would tax all residents an equal share of their income, specifically taxing 4% on income over one million dollars. The projected $2 billion per year in additional tax revenue would be designated for education and transportation. |
| Groundwork Somerville |  | Community / Advocacy | Promotes sustainable community development and revitalization while empowering individuals to lead happier, healthier, and more prosperous lives. This is achieved by creating opportunities for healthy education, green jobs, and sustainable community. |
| Hubway ▯ Blue Bike Expansion |  | Regional | In partnership with Blue Cross Blue Shield of Massachusetts, Hubway will re-launch as Blue Bikes in the spring of 2018 with a newly expanded and updated bike-share system. By the end of 2019, the current number of 1,800 bikes is expected to increase to 3,000, with the addition of 100 new stations throughout the four served municipalities of Boston, Cambridge, Brookline and Somerville. |
| LivableStreets Alliance |  | Community / Advocacy | Advocates for innovative and equitable transportation solutions that create safe, affordable, and convenient options for everyone in Metro Boston. Progress is achieved by building public support, education decision-makers and thought leaders, and working to advocate specific projects and initiatives throughout the area. |

| NAME | TOPIC | CATEGORY | DESCRIPTION |
|---|---|---|---|
| MAPC Health Impact Assessment – Sound Barriers |  | Regional | Evaluates the potential effects that policies, plans, programs, or projects will have on the health of a community, neighborhood, or other population. The MAPC is currently soliciting community input toward the installation of sound barriers along the I-93 corridor of Somerville. |
| MAPC Lower Mystic Walking Routes Program |  | Regional | MAPC has been working with Boston, Chelsea, Everett, Malden, Medford and Somerville to identify potential walking routes that would connect neighborhoods with the lower Mystic River and its tributaries. |
| MAPC Mystic River Corridor Strategy Project |  | Regional | A collaborative effort between MAPC, Boston Redevelopment Authority (BRA), and the Cities of Chelsea, Everett, Malden, Medford, and Somerville. MAPC is helping these communities develop a targeted strategy for realizing the full potential of the Mystic River, and working to raise community awareness on the project. |
| MAPC Regional Dockless Bike Share |  | Regional | Launching of one of the largest regional bike share systems in the country in partnership with 16 municipalities that will incorporate station-free, or "dockless" technology. Riders can pick up and drop off bikes anywhere within the service area, needing only a smartphone to get started. |
| MassDOT Infra-Space Program; Kensington Underpass, Broadway at I-93, Gilman Street |  | Legislative / State | Identifies areas under elevated roads, bridges, or viaducts to undergo possible redevelopment. The Kensington Underpass is one such area, located underneath I-93 between Exits 28 and 29. |
| MassBike |  | Community / Advocacy | Promotes a bicycle-friendly environment and encourages cycling for fun, fitness, and transportation. |
| MBTA Green Line Extension |  | Legislative / State | The Green Line will extend past its current terminus at Lechmere Station and continue into Somerville. There will be new stops at Union Square, East Somerville, Gilman Square, Magoun Square, Ball Square, and College Avenue. |

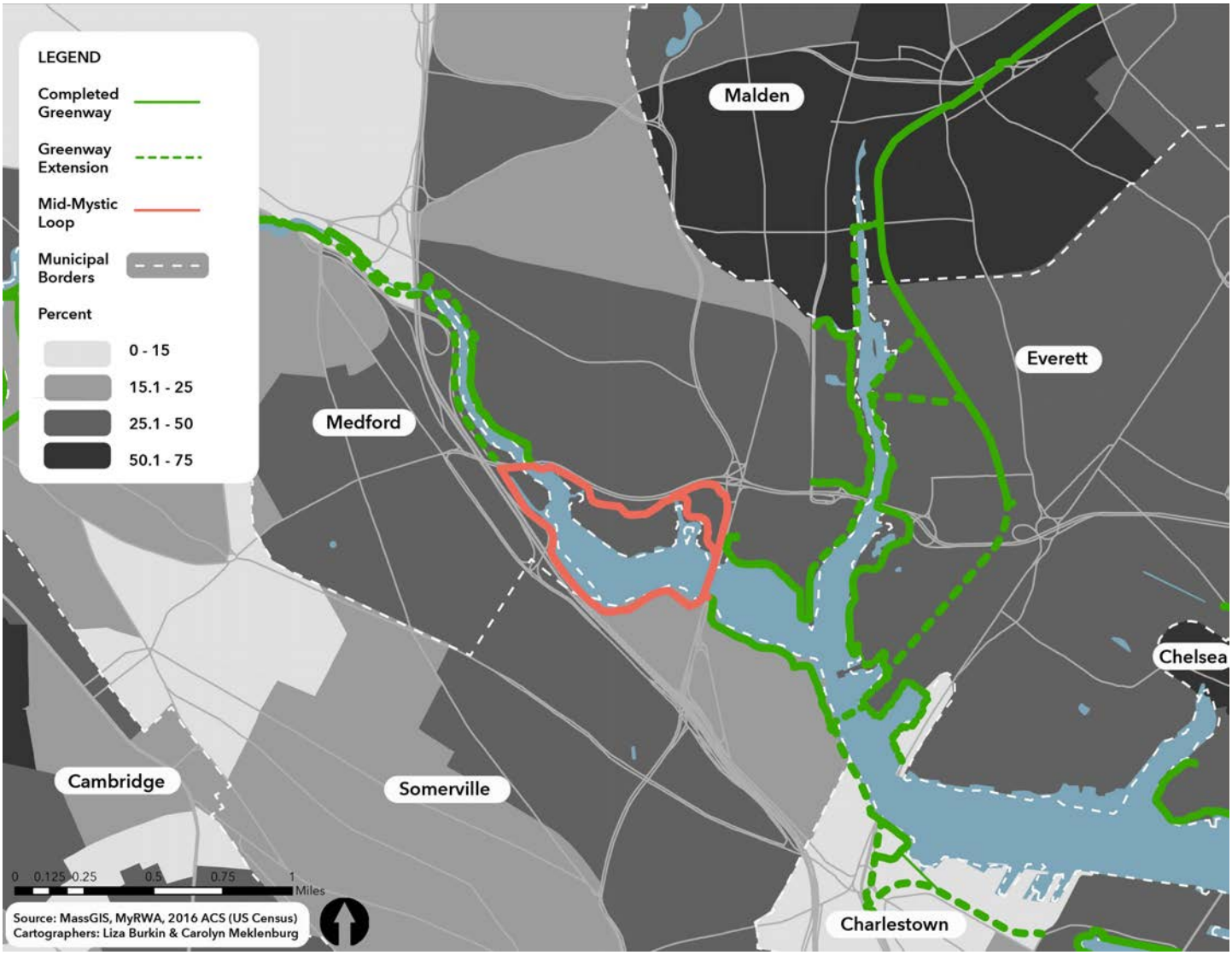
| NAME | TOPIC | CATEGORY | DESCRIPTION |
|---|---|---|---|
| Medford Bicycle Advisory Commission |  | Municipal | Encourages those who live, work, and travel in Medford to ride bikes by educating road users on how to ride and drive safely, advising the city on ways to improve infrastructure, and organizing the local community of cyclists. |
| Medford Square Master Plan |  | Municipal | A comprehensive plan to leverage new investment in mixed-use and walkable districts to invigorate vitality, expand access to health and cultural resources, and activate a revitalized downtown. |
| MOR-EV electric vehicle rebate program |  | Legislative / State | Aims to provide air pollution emission reductions for the Commonwealth by increasing usage of electric vehicles. |
| Mystic River Watershed Association |  | Community / Advocacy | Mission is to protect and restore the Mystic River, its tributaries and watershed lands for the benefit of present and future generations and to celebrate the value, importance and great beauty of these natural resources. |
| Noise and the City |  | Community / Advocacy | Devoted to documenting the soundscape of urban life through real-time noise monitoring and community noise surveys. Additionally aims to work toward gaining a better understanding of how community noise impacts human health. |
| Rutherford Avenue / Sullivan Square Redesign Project |  | Municipal | The City of Boston is working with the local and regional community to design a more people-friendly corridor between Sullivan Square and City Square by improving pedestrian connections and safety to MBTA transit stations and the community, decreasing traffic congestion, protecting Main Street from cut-through traffic, creating public and open space, providing opportunities for appropriate development, and providing bicycle connections. |
| Shape Up Somerville |  | Municipal | Builds healthy, equitable communities in Somerville through interdisciplinary partnerships, programming, and policies related to food systems and active living. |

| NAME | TOPIC | CATEGORY | DESCRIPTION |
|---|---|---|---|
| Somerville Bicycle Committee |  | Municipal | Works to promote bicycling as a means of transportation, to improve safety for all ages, and to help implement policy and programs in the City of Somerville. |
| Somerville Transportation Equity Partnership (STEP) |  | Community / Advocacy | Advocates for greatly needed transportation improvements for Somerville. Mission is to secure transportation that will increase social equity, environmental health, and economic opportunity by advocating for public transportation improvements that will promote the best land uses and will reduce traffic in Somerville. |
| Somervision |  | Municipal | The comprehensive master plan for the City of Somerville that aims for the city to become a more exceptional place to live, work, play and raise a family. |
| WalkBoston |  | Community / Advocacy | Makes walking safer and easier in Massachusetts in order to encourage better health, a cleaner environment, and more vibrant communities. |
| Wynn for All "Mystic Mile" Roadway Improvements |  | Regional | Wynn Casino has set aside approximately $58 million to be allocated to road and traffic improvements that will be completed over the next several months, with the most significant work occurring within the lower Mystic River Watershed. Areas include Sullivan Square in Charlestown, Route 99/Lower Broadway in Everett, Sweester Circle in Everett, and Wellington Circle in Medford. |

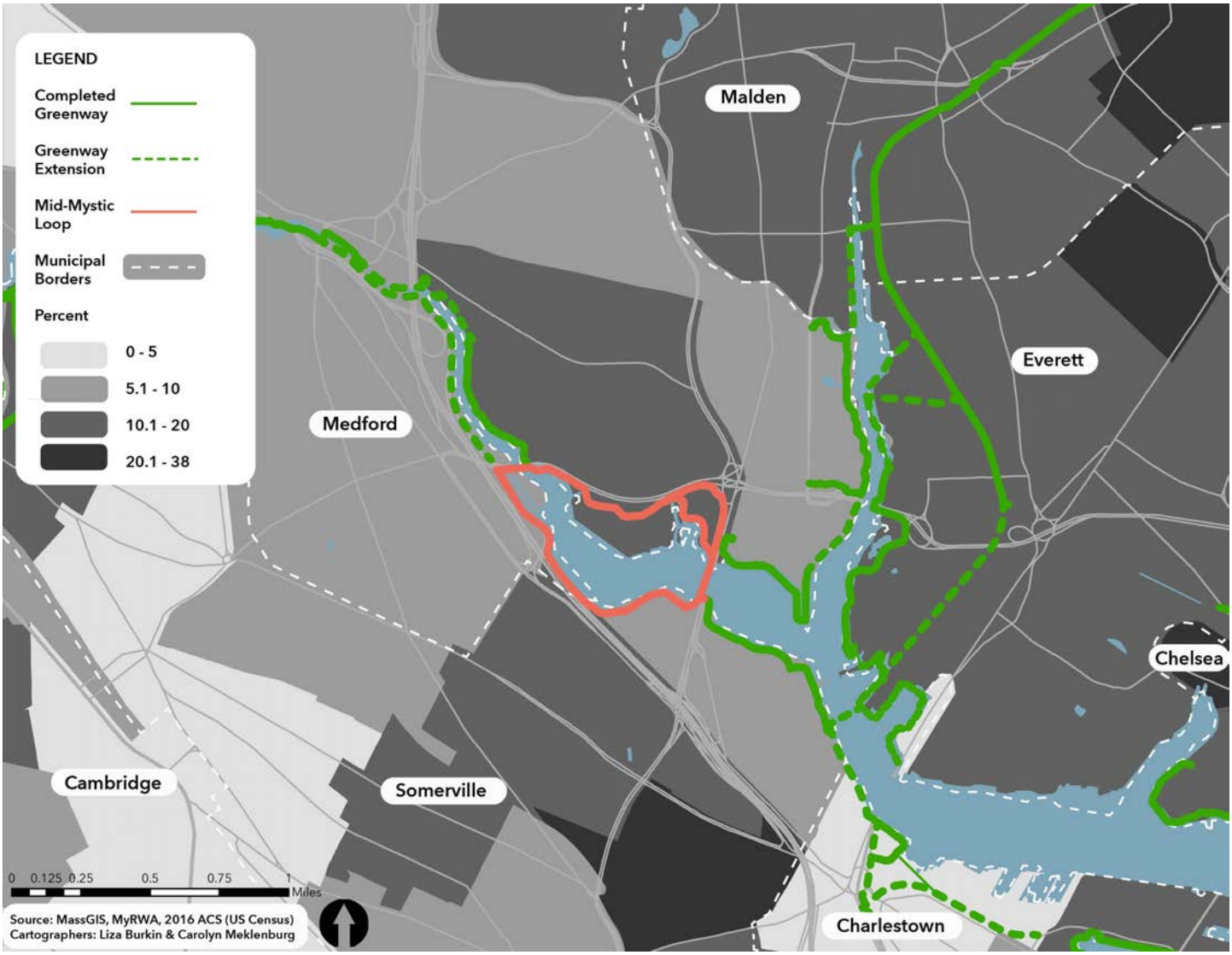
# APPENDIX D: DEMOGRAPHIC MAPS



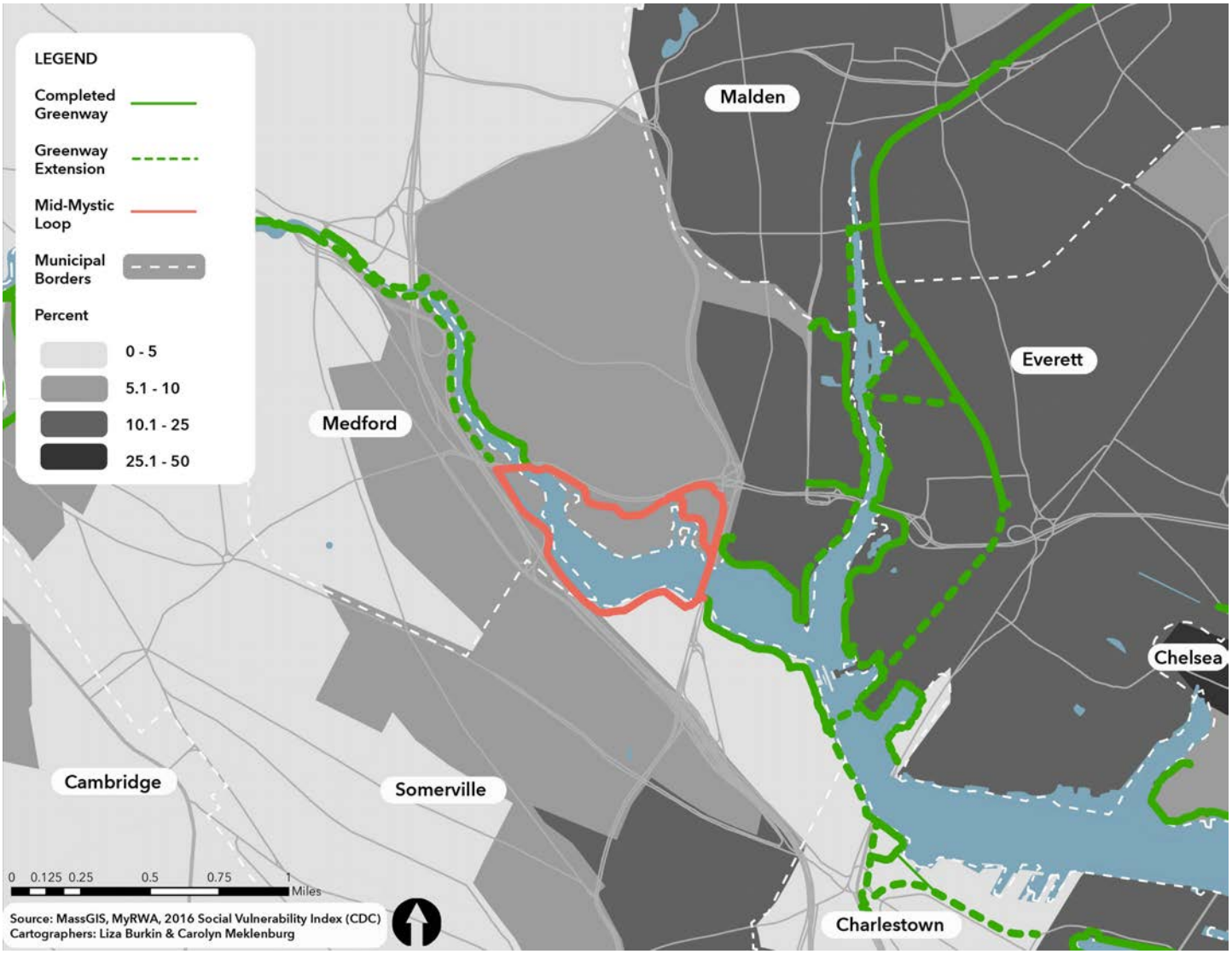

Percent of Population Age 17 And Younger, And Age 65 and Older, By Census Tract



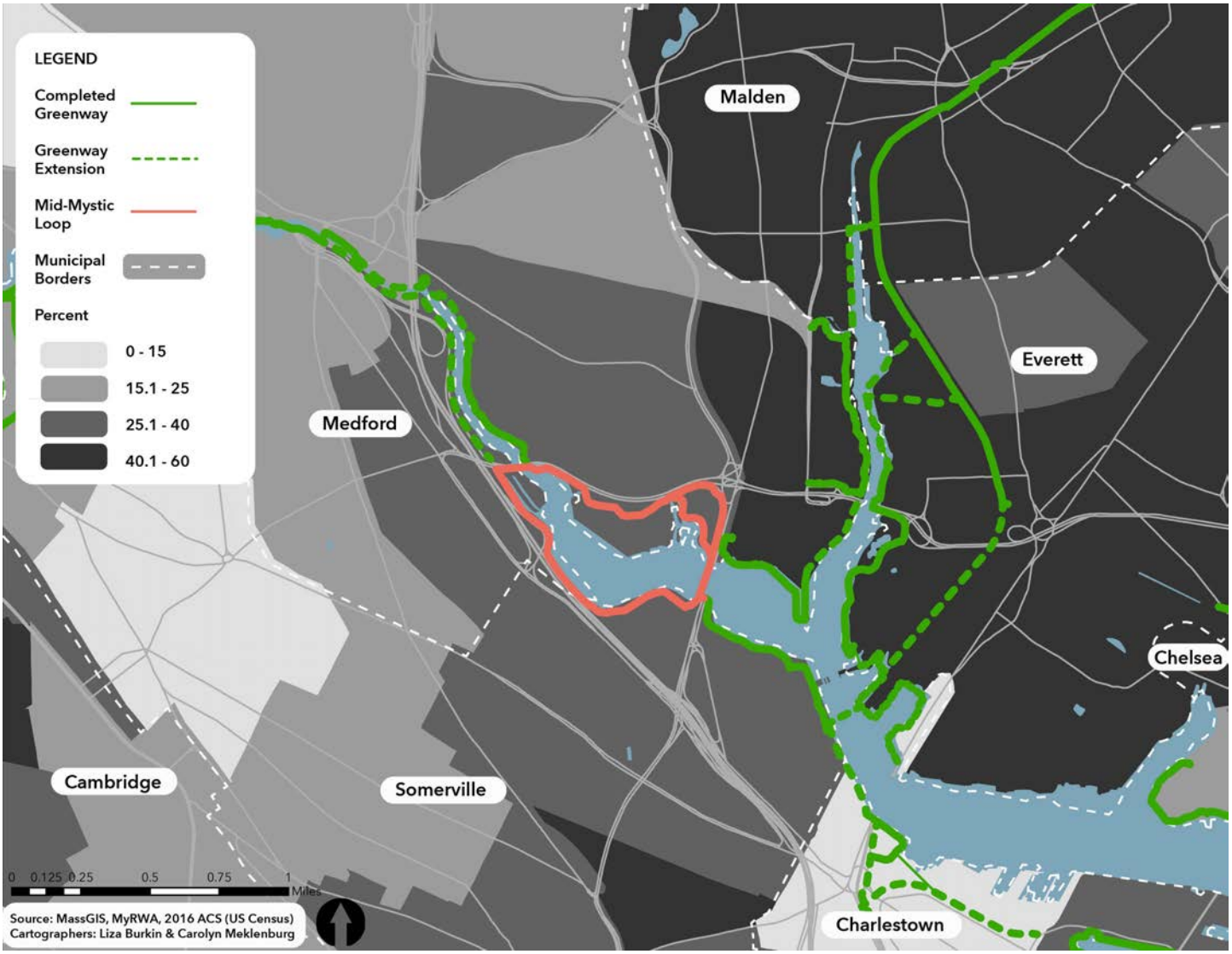

Percent of Population that ts Nonwhite and Nonhispanic, by Census Tract



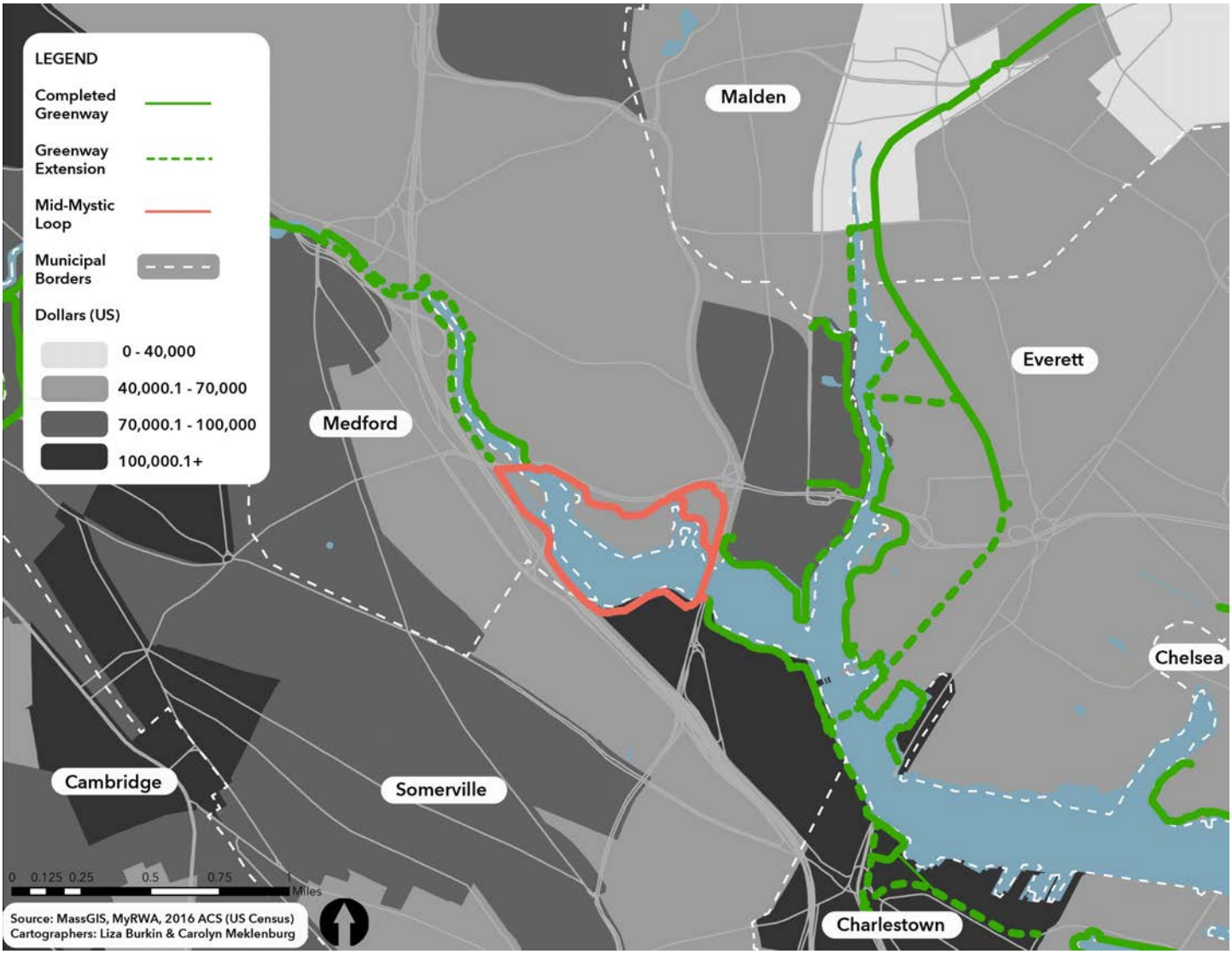

Percent Of Population Age 25 Or Older That Does Not Have A High School Diploma Or Equivalent, By Census Tract




Percent Of Population Age Five And Older That Speaks English "Less Than Well," By Census Tract




Percent Of Population That Is Foreign Born, By Census Tract




Median Household Income, By Census Tract

# APPENDIX E: ROUTE AUDITS

## MAGOUN SQUARE TO BLESSING OF THE BAY

On my way to Blessing of the Bay, I took the route identified by the MAPC in their 2011 study on walking routes to the Mystic River, which is approximately 1.2 miles and takes about 23 minutes to walk.

Magoun Square is one of Somerville's many "squares," situated between Ball Square and Winter Hill. My first challenge was crossing Broadway – a very wide street that I usually have to rush to get through in the time allotted. Although crosswalks that did not have lights were well marked on the road, the width of the crossing itself makes it stressful for pedestrians.

Sidewalks are present on both sides of the entire route, but on one side, the sidewalk is elevated to accommodate the slope of Winter Hill. This elevated section is only accessible by stairs in some sections, which would be prohibitive for many users. The remainder of the sidewalk for these stretches is quite narrow, around three feet.

This route takes walkers down Temple Street, and then through the Somerville Housing Authority's Mystic View residences. I found this part of the route to be rather confusing, as there are many side roads within this housing complex. However, this creates a much nicer walk than the alternative–walking along the Mystic Valley Parkway. The route finally takes you to the intersection of Shore Road and Mystic Valley Parkway, at which point you can see the beautiful mural that runs along the Parkway, underneath I-93.

The walk through the underpass is unpleasant, as the air is stuffy and smells of exhaust. The rumbling of the highway overhead is also unnerving. I realized–when it was too late–that you have to cross Shore Drive before going through the underpass, as there is no crosswalk to Blessing of the Bay once you've reached the other side.

On the return trip to Magoun Square, I took the route that Google Maps recommended with a slight adjustment – instead of walking along the Parkway, I attempted to cut through the Somerville Housing Authority's Mystic View development again, and then through the Healey Elementary School. However, the Healey School is situated on a hill overlooking Mystic View, so there is only one route that connects from Mystic View to the school (which I did not find right away!).

Once I found my way through the schoolyard, the walk was quiet and traversed Medford residential neighborhoods. The only difficult crossing was from Fremont across Main Street to get to Bow Street– there was no crosswalk, and Main Street is rather wide. The walk continued to be peaceful, quiet, and relaxing, until reaching the chaos of Magoun Square once again.

## UNION SQUARE TO BLESSING OF THE BAY

Union Square is one of Somerville's most dynamic areas – full of restaurants, shops, music venues and mixed-income housing. Roughly 1.7 miles southwest of the Mystic River, it is undergoing rapid change with the coming of a Green Line station and the US2 development. Future years will see Union Square's urban form rise and densify – many parcels in the area are expected to be redeveloped into high-rise, mixed-use buildings similar to Kendall Square in Cambridge. Thus, it is extremely important to also enhance river access for this growing part of Somerville.

Currently, the most challenging aspect of biking or walking from Union Square to the Mystic River is the topography – any route will be extremely hilly as it must cross both

Prospect Hill and Winter Hill before arriving at the Mystic.

Google currently puts you on Walnut Street from Union to Broadway – a low traffic, residential street with sharrows, but extremely steep. Bicyclists need to take the lane here while going uphill in order to avoid being passed too quickly by cars. Removing on-street parking on the right side of Walnut would create room for a "climbing bike lane" – important for steep hills when bike traffic moves slowly.

After arriving on Broadway, the same problems of high speeds, huge street widths, and little paint on the road to separate different traffic modes is encountered. Once you turn right onto Temple Street the rest of the route is mostly comfortable. You cross underneath I-93, and then turn left on residential Bailey Street to get to Blessing of the Bay.

## DAVIS SQUARE TO BLESSING OF THE BAY

Davis Square is Somerville's most well-known pedestrian hot spot. It is one of the few places in the city where people go just to walk around and hang out on the street – a truly public realm.

To get to Blessing of the Bay from Davis, the first half of the route is along the lovely and safe Somerville Community Path. A shining example of active transportation infrastructure, this space is accessible for everyone. Unfortunately, at some point you have to leave the comfort of the SCP. Google maps direct you to take a left on Cedar Street, which provides a direct connection to Broadway. As a two-way collector road through Somerville, Cedar Street is a relatively uncomfortable road for bicyclists – sharrows exist directing bicyclists to take the lane.

Upon arriving on Broadway, pedestrians and bicyclists would follow the same route to Blessing of the Bay as the Magoun Square route.

Alternatively, if trying to reach more western points along the Mid Mystic Loop or travel across the river to Medford, walkers and bikers may choose to go northeast on College Ave, through Powderhouse Circle (major problem spot), straight on Warner Street, and continue on the Tufts to Blessing of the Bay Route.

## BUNKER HILL MONUMENT TO MT. VERNON RESTAURANT AND PUB

Despite the Bunker Hill Monument's status as a tourist destination, there were no bike lanes present around Monument Square or Bunker Hill Street. Were a cyclist to ride from the monument to Mt. Vernon Restaurant, which is located near Sullivan Square, the ride may have been more difficult due to the lack of designated bike infrastructure. As a pedestrian however, the walk was pleasant, at least until Sullivan Square. Overall, the sidewalks were in good condition, albeit a bit narrow on Concord Ave and most intersections had crosswalks. Only the intersection of Mead Street and Bunker Hill Street, Pearl Street and Bunker Hill Street and Auburn Street and Bunker Hill Street were missing crosswalks.

However, the pleasant walk turned stressful upon approaching Sullivan Square. From the perspective of a pedestrian Sullivan Square is a tangle of frustrating intersections posing as a rotary. To get to Mt. Vernon Square I had to travel halfway across the rotary. To do that I had to cross a number of streets with faded crosswalks and inefficient cross lights. Many cross lights were too long or were not present. While there was somewhat surprisingly bike infrastructure, much of it came in the form or sharrows or very worn out and confusing bike lanes. After finally

making it past Sullivan Square, I was led to a noisy, dark and dirty underpass, but soon after made it to my final destination. Overall bike and walk infrastructure needs updating around Sullivan Square, but otherwise was perfectly fine. One suggestion for Bunker Hill Street though would be to add a bike lane.

## MEDFORD HIGH SCHOOL, MEDFORD SQUARE TO THE MYSTIC RIVER

Source of Route: Google Maps

Starting from Medford High School, the way to Medford Square is quite straightforward–I walked on the sidewalk along Winthrop St/Rte 38 for most of the route. Sidewalks are continuous along both sides, and in relatively good condition.

However, while mostly unobstructed, the sidewalks do vary in width. Where Winthrop St. runs through residential neighborhoods, the sidewalks are about four feet (picture at right–4 ft sidewalks at 350-360 Winthrop St.); this is not up to ADA standards of five feet, nor does it leave enough room to pass other pedestrians. Sidewalks became much wider in front of the small neighborhood parks along the route, however, as well as where Winthrop approaches Medford Square.

There is a "River Route" sign at the intersection of Winthrop and Lawrence Streets, but it is the only sign until you get much closer to the river.

The small roundabout known as Winthrop Square has clear crosswalks and neon pedestrian signs. However, crossing remains quite difficult as cars are unlikely to stop since they're focused on moving through the roundabout.

There are some clear improvements, including a sidewalk extension/curb bump out that makes one of the crossings much shorter.

The crossing at Winthrop and Mystic Valley Parkway is adequate and feels quite safe. Here is where the "River Route" signs are much more frequent, leading pedestrians from the Parkway to the Winthrop Community Gardens and the paved pathway that leads to the Condon Shell. This route is lined with plenty of green space!

The final, problematic intersection along this route is back across Mystic Valley Parkway from the greenway to Medford Square. While there is a crosswalk and a light, the wait for the light is rather long, and truly feels like you're crossing a "highway"–a jarring crossing to make after such a pleasant walk along the river.

Once you reach the other side, a bright green, charming pedestrian bridge crosses into Medford Square! The width of the bridge, however, is only four feet wide, and while it has both stair and ramp access, this width is not ADA compliant. Additionally while there are plenty of signs leading to the bridge from the back of the square, once I reached the sidewalk, there were no signs pointing back towards the river.

## FROM WELLINGTON T STATION TO FERMENTATION DISTRICT

It is a little unfair to judge this route as it is undergoing major construction but there are a number of issues unrelated to the construction. At Wellington T-station the sidewalk needs to be repaired or even replaced.  The sidewalk in the parking lot has been cracked due to the presence of a tree branch, and overall is too narrow. For those who are disabled these updates are crucial. Walking to Rt. 16 was a bit confusing but once on the path it was well delineated. The path was exactly 5 feet wide, making the path regulation, however there would be little space for bikes passing each other. Once out of the construction zone I arrived at Santilli Circle, which was confusing.

Although I wanted to go left around the circle, it seemed to make the most sense to head right as there were more crosswalks in this direction. Many of the crosswalks were too long and there was a distinct lack of bike lanes around the rotary. Once making past Santilli Circle I arrived on Santilli Highway where the sidewalk was too narrow despite looking new. After walking about 500 feet the sidewalk disappeared despite their needing to be one. The sidewalk gave way to grass, which was trampled, into mud with use

| Primary Goal | Street Type Permitted On | Tools | Pictures | Speed Reduction | Less Traffic | Emergency Delay |
|---|---|---|---|---|---|---|
| **Auto Speed Reduction** | All Streets | Enforcement | | Varies | No | No |
| | | Smart Cart |  | | | |
| | | Speed Reader Board |  | Varies | No | No |
| | | Medians |  | Varies | No | Maybe |
| | Local Service | 14 ft Speed Bumps |  | Yes, 85% to 25 mph | Maybe | Yes 1.0-9.4 sec each |
| | Local Service, Neighborhood Collector | 22 ft Speed Table |  | Yes, 85% to 30 mph | Maybe | Yes 0.0-9.2 sec each |
| | | Chicanes |  | Varies | Maybe | Maybe |
| | Truck Streets | Corner Truck Island |  | Varies | No | Maybe |

## TO NEIGHBORHOOD LIVABILITY GOALS

| Cost | Notes | Examples |
|---|---|---|
| $60-90/hr<br>~$100 in personnel time to place on street. | Duration of effectiveness unclear. New smart carts are approximately $5,000. | |
| Permanent = $8,000 | Temporary is placed for 2-week intervals, effectiveness unclear. | September 2008, program on hold. |
| $40/SF or $15,000-$20,000 per location | Speed reduction greatest on curves. Limits ability of emergency vehicles to cross centerline. Cost is function of length of project and existing right of way use and width. | N Smith, St Louis to Columbia Way |
| $2,500 each | Most effective tool to reduce speeding. Emergency delay varies with desired speed and vehicle. | N/NE Dekum - Vancouver to MLK<br>NE Ainsworth - 42nd to Lombard<br>NW Mill Pond Rd - McDaniel to Engelman<br>SE 111th Avenue - Division to Powell<br>SW 50th - Taylors Fry. Rd to Orchid |
| $2,500 each | Most effective tool to reduce speeding. Emergency delay varies with desired speed and vehicle. | N Vancouver, Columbia to Ainsworth<br>NW Cornell Road - Lovejoy to Tunnel<br>SE 71st Avenue- Division to Powell<br>SW 35th Ave, Vermont to Troy<br>SW Fairview Blvd - Skyline to Kingston |
| $10,000-$20,000 per set | Paired curb extensions or roadside islands create a serpentine path for autos. Effectiveness and ER delay is a function of traffic volume. | Not yet used. |
| $20,000 per corner | Dual radii corners: smaller radius to slow autos and is mountable by trucks. Pedestrians wait at larger radius farther back when trucks are turning. | Not yet used. Potential testing in 2008/2009 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Designated Emergency Response Routes | Offset Speed Table |  | Yes | Maybe | Yes, 2-4 sec each |
| | | Speed Cushions |  | Maybe | Maybe | Yes, 2-4 sec each |

| Primary Goal | Street Type Permitted On | Tools | Pictures | Speed Reduction | Less Traffic | Emergency Delay |
|---|---|---|---|---|---|---|
| **Auto Traffic Reduction** | Local Service | Semi-diverter Island |  | No | Yes, Directional | Maybe |
| | | Full Diversion |  | No | Yes | Usually |
| | | Planter Diverters |  | No | Yes | Usually |
| | | Pinch Points |  | Localized | Maybe | Maybe |
| | | Green Curb Extension Diverter |  | No | Yes | Maybe |
| | | Traffic Circle Retrofit |  | Localized | Yes | Yes |

| | | |
|---|---|---|
| $3,000 each pair | Currently slated for testing in Portland (2011). Currently in use in Beaverton on one roadway. | Tested in 1997. Not yet used. |
| $3,000 each | Currently testing in Portland (2011). Currently in use in Vancouver. | |

| Cost | Notes | Examples |
|---|---|---|
| $10,000 | May pose inconvenience to typical road user. Residence nearest closure will have greatest auto trip length after project is complete. Diversion is tool of last resort. | NE 17th and Shaver<br>NE 16th and Tillamook<br>SE Clinton at 39th<br>NE 28th at Weidler |
| $15,000+ | May pose inconvenience to typical road user. Residence nearest closure will have greatest auto trip length after project is complete. Diversion is tool of last resort. | NE 28th and Wasco |
| $5,000+ | May pose inconvenience to typical road user. Residence nearest closure will have greatest auto trip length after project is complete. Diversion is tool of last resort. | N Tyler and Central |
| $10,000+ | Paired curb extensions or roadside islands create a single auto lane. Effectiveness and ER delay is a function of traffic volume. | Not yet used |
| $40,000 | May pose inconvenience to typical road user. Residence nearest closure will have greatest auto trip length after project is complete. Diversion is tool of last resort. | SE Gladstone at 42nd<br>SE Spokane at 13th |
| $10,000+ | The addition of medians at a cross street to prevent auto movement in one or two directions. | Not yet used |

| Primary Goal | Street Type Permitted On | Tools | Pictures | Speed Reduction | Less Traffic | Emergency Delay |
|---|---|---|---|---|---|---|
| **Pedestrian Safety** | All Streets | Sidewalks and Paths |  | No | No | No |
| | | Refuge Islands |  | 1-3 mph | No | No |
| | | Curb Extensions |  | No | No | No |
| | | Marked Crosswalks |  | No | No | No |
| | | Crossing Signs and Beacons |  | No | No | No |
| | | Countdown Pedestrian Signals |  | No | No | No |
| | Local Service, Neighborhood Collector | Raised Crosswalks |  | Yes | Maybe | Yes 0.0-9.2 sec each |
| | | Speed Bumps/Tables | | Yes | Maybe | Yes, varies with size |

| Cost | Notes | Examples |
|---|---|---|
| $10 per square foot | Cost is function of project size and topography of right of way. | SW Patton at Dosch<br>SW 35th at Maricara |
| $14,000-$60,000 | Primarily for crossing safety. For locations where gap study indicates more than a 2 minute wait during peak traffic hours or where pedestrians must cross multiple lanes. Provides pedestrian crossing enhancement with minimal delay to autos on higher classified streets (auto-focused). | N Dekum at Durham<br>N Portland at Fenwick<br>NE 15th Avenue - Fremont to Prescott<br>NW 25th at Pettygrove<br>SE Gladstone, 26th to 39th Avenue<br>SW B-H Hwy at 62nd |
| $13,000-$40,000 | Primarily for crossing safety. For locations where gap study indicates more than a 1 minute wait during peak traffic hours. Space behind curb can be used for water quality structure making design a 'Green' curb extension. Provides pedestrian crossing enhancement with minimal delay to autos on higher classified streets (auto-focused). | N Denver at Kilpatrick<br>N Portland at Vancouver<br>SE 21st at Tibbetts<br>SE Gladstone, 26th to 39th Avenue<br>NW 21st at Flanders |
| $1,000- $1,500 | Signing adds to cost. | |
| $200 for signs<br>$12,000 per beacon;<br>$150,000 for Hybrid | Minimum is two per crossing ($24,000); Beacons are solar powered with infra-red communication (no excavation for wiring). On a 4+ lane street the number is 3 per crossing ($36,000). | SE 30th at Salmon (Sign)<br>NE 33rd and Emerson (Beacon)<br>SE 82nd at Francis (Rapid Beacon)<br>SE Foster at 80th (Rapid Beacon)<br>E Burnside at 41st (Hybrid) |
| $500/800 each | Cost is a function of age of existing pedestrian signal head. | Interstate Avenue |
| $3,500 | 22-ft or larger speed bump at crossing with crosswalk markings slow vehicles where needed the most. Emergency delay varies with desired speed and vehicle. Each new ramp adds $2,000. | SW Vermont at 13th Avenue<br>N Albina, north of Killingsworth |
| $2,500 | Safety improvement from lower vehicle speeds. Emergency delay varies with desired speed and vehicle. | SE Clinton, 26th to 39th Avenue |

| Primary Goal | Street Type Permitted On | Tools | Pictures | Speed Reduction | Less Traffic | Emergency Delay |
|---|---|---|---|---|---|---|
| **Bike Safety** | Any Street | Crossing Signs |  | No | No | No |
| | | Rapid Flash Beacons |  | No | No | No |
| | | Shared Lane Markings – Sharrows |  | No | No | No |
| | | Forward Stop Bar |  | No | No | No |
| | | Bike Turn Pockets |  | No | No | No |
| | High Volume, Multi-lane Crossings | Bike Lane Crossbike |  | No | No | No |
| | | Intersection Crossbike |  | No | No | No |
| | | Hybrid Beacons |  | No | No | No |

| Cost | Notes | Examples |
|---|---|---|
| $200 for signs | Minimum is two per intersection, usually placed near-side right. | N Denver at Terry<br>NE 21st at Klickitat<br>SE Harold at 101st Ave |
| $12,000 per beacon pole | Minimum is two per crossing ($24,000); Beacons are solar powered with infra-red communication (no excavation for wiring). On a 4+ lane street the number is 3 per crossing ($36,000). | SE 82nd at Francis<br>SE Foster at 80th<br>NE MLK at Bryant – planned 2011<br>SE Holgate at 87th – planned 2011 |
| $250 each | Placed in travel lanes at 250 ft spacing. If used in both directions on street, opposite direction markings are offset 125 feet. | Going Greenway<br>Houghton Greenway<br>Wabash Greenway |
| $300 each | Second stop location so cyclists can better see conflicting cross traffic. | SE Clay at 12th Ave<br>SE Clay at 11th Ave |
| ~$500 | Space at side or center of roadway to provide location for cyclists to pause before turning. Removes cyclist from through traffic pathway. Cost is a function of length of lane. | N Vancouver at Going<br>SE Stark at 41st Ave |
| $180/Lane Crossed - One Direction | Similar to the marking used to alert drivers of a pedestrian crossing, except for cyclists. Typically matching color of colored bike lane markings | MLK at Bryant – Planned 2011 |
| $840-$1100/Lane Crossed 4 Lanes = $4,500 | Green marking fills intersection to increase target value of marking for approaching motorists. | |
| $150,000 | Rests in off. Has flashing red after solid yellow and red. | E Burnside at 41st |

| | | | | | |
|---|---|---|---|---|---|
| | Bike Signals |  | No | No | No |
| | Bike Button |  | No | No | No |
| Streets over 3,000 vehicles per day | Std. Bike Lanes |  | No | No | No |
| | Buffered Bike Lane |  | No | No | No |
| | Contra Flow Bike Lane |  | No | No | No |
| | Bikeman with arrow |  | No | No | No |
| | Colored Bike Lanes |  | No | No | No |
| | Surface Cycle Track – Parking Protected |  | No | No | No |
| | One way Cycle Track – Raised, Parking Protected |  | No | No | No |

| | | |
|---|---|---|
| $10,000 | Typically provides protected movement for cyclist where an auto conflict exists. | NE Broadway at Williams (Wbnd)<br>N Oregon at Lloyd/Interstate<br>SW Broadway at Lovejoy (Wbnd) |
| $5,000 | Adds button at pedestrian actuated signals so cyclist can request walk signal. | SE Chavez at |
| $3+ per foot | Cost is function of length of project and existing right of way use and width. Bikeman and arrow not included. | SE Gladstone, 26th to 39th Avenue |
| $5 per foot | A marked separation between a bike lane and a travel lane or parked cars. | E Burnside at I-205<br>SE Holgate I-205 to 122nd<br>SE 101st, Foster to Woodstock |
| $2/foot | Double yellow centerline cost only. Needed parking removal or other markings would be extra. | N Williams north of Killingsworth |
| $250 each | Placed in bike lanes at 500 ft spacing | |
| $8/SF, a 5 ft wide green path would be $40/Ft | Used where bike lanes and auto lanes cross or otherwise have conflicting movements. | SE Madison east of Grand<br>SW Terwilliger east of I-5 |
| ~$1600/Block One direction | Buffer - $5/Ft, Bikeman every 250 feet, $250, green box at each block (7'x7') $300. | SW Broadway S/Clay |
| $500/Ft | Commonly part of a larger project. Requires drainage impact mitigation. | NE Cully Blvd, N/Prescott |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | Two way Cycle Track, Raised Roadside |  | No | No | No |
| | | Bike Box |  | No | No | No |
| | | Copenhagen Left Box |  | No | No | No |

| | | |
|---|---|---|
| $700 per foot | Used where a bike route jogs on a high volume street. Often short segments under 200 feet. Drainage impact mitigation handled at ends of track. | NE 33rd at Going – Built<br>Planned:<br>SE 130th@Stark, Division, Powell<br>NE Killingsworth, 54th/55th |
| $5,000 | Used where cyclist volumes are high or where there is a history of turn-hook crashes. | |
| $1,000 | A small box, often placed in the shadow of a parking lane, to show cyclists where to wait when making a 2-stage left turn. | SW Broadway at<br>SE Foster at Center |

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