COMPLETE STREETS IN NASHUA NH

a guide

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PLAN4Health
An American Planning Association Project

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"Of all the exercises, walking is best.
No one knows, till he tries, how easily a habit of walking is acquired."
Thomas Jefferson, 1786

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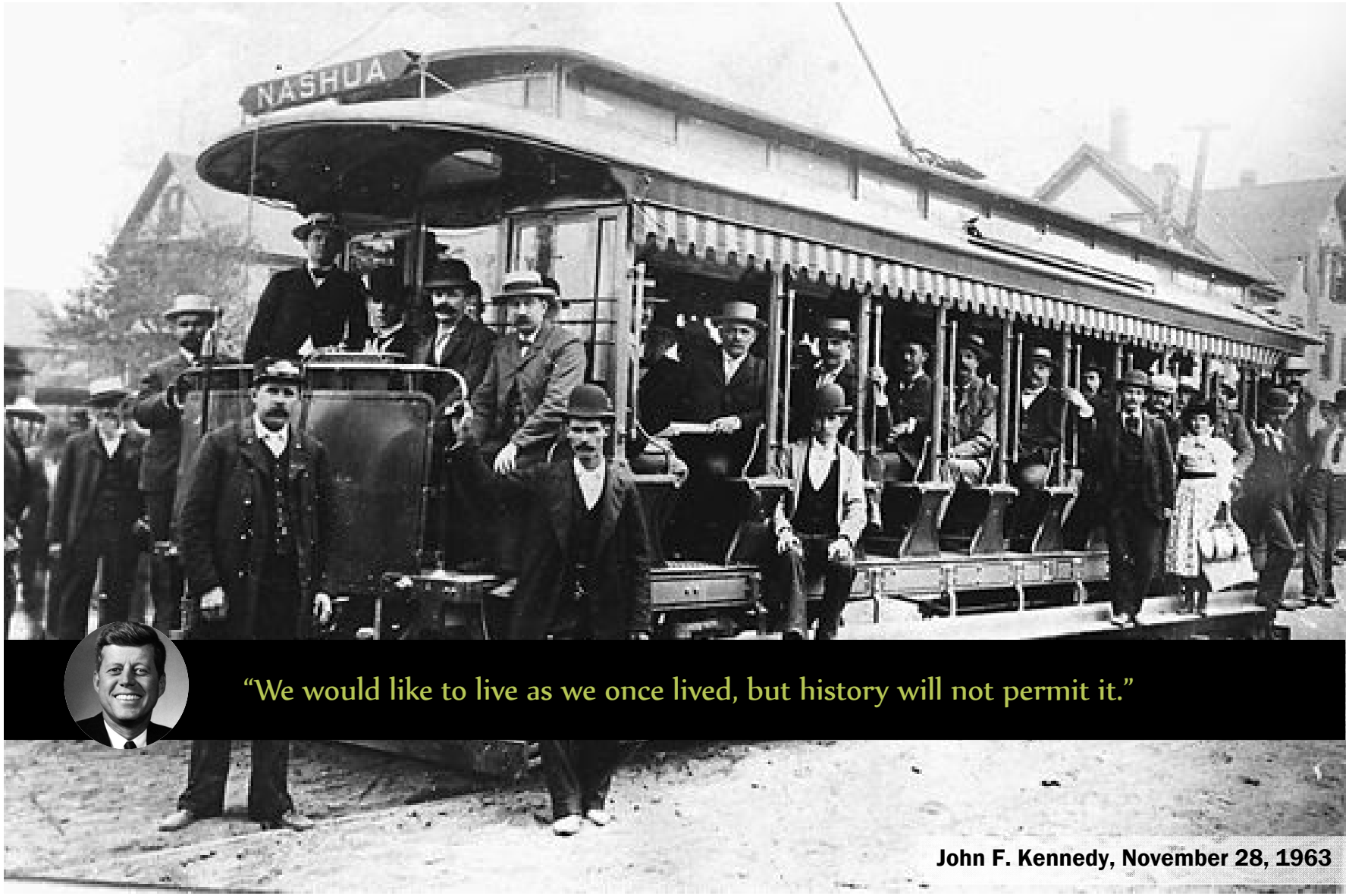
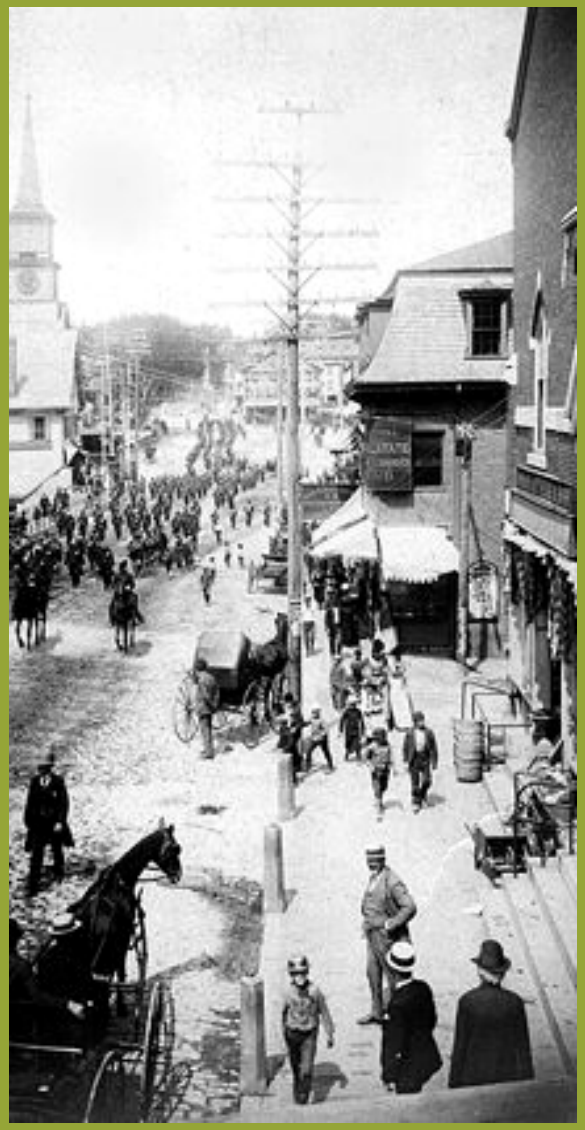

NASHUA
"We would like to live as we once lived, but history will not permit it."
John F. Kennedy, November 28, 1963



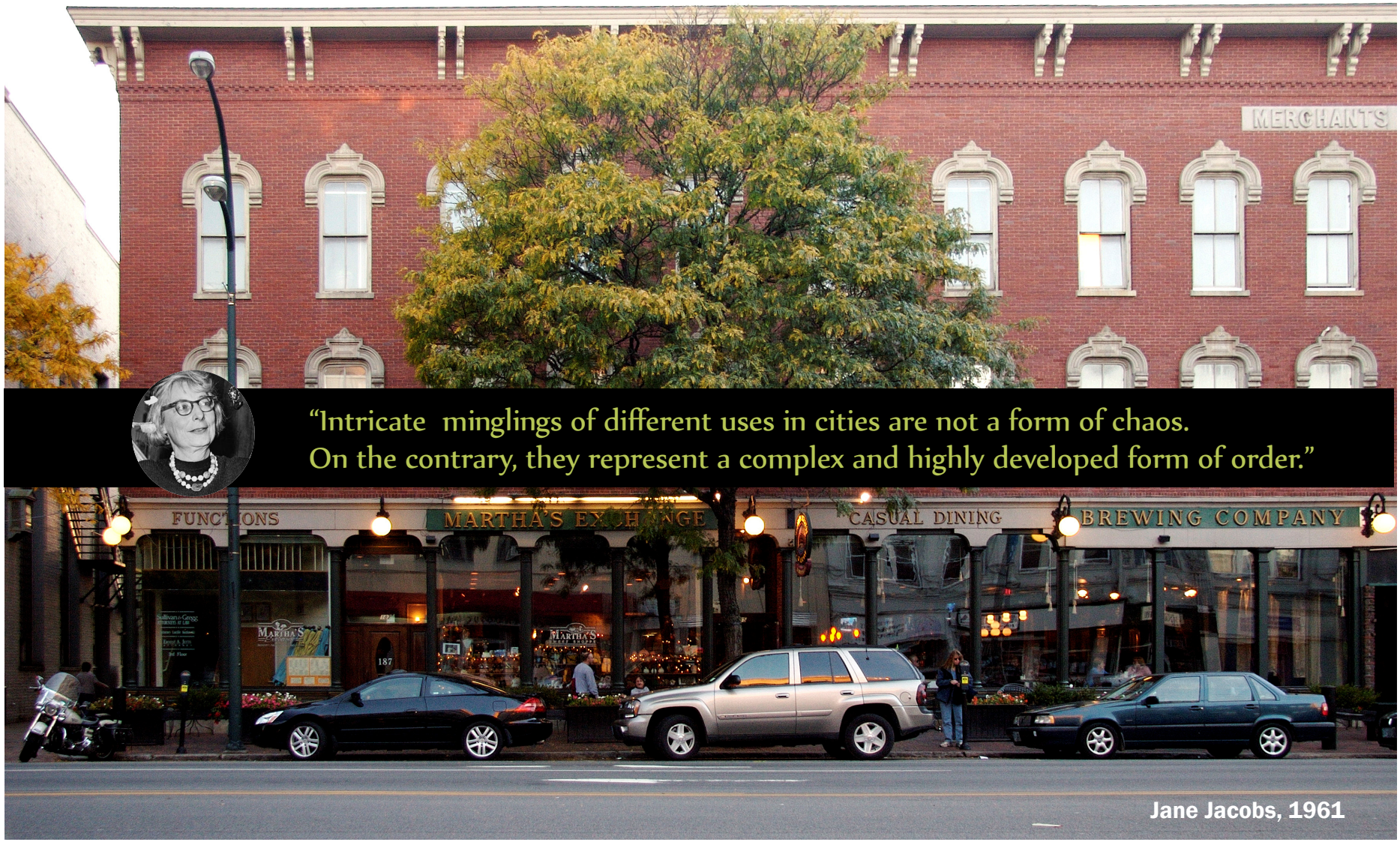
Images courtesy Nashua Historical Society

complete streets are in our bones

The year is 1900, and if you live in Nashua, most everything you could need is downtown, where pedestrians converge on the curbs and streets alike, jostling for space with stagecoaches and automobiles. Streetcars crisscross city streets and meet downtown, where you can board trolleys for Manchester or Canobie Lake Park. A nearby train station attracts riders destined for neighboring towns or more distant places, like Boston, Keene, or Lowell. Residents often cycle to the 'Willows,' a couple miles northwest of town, to enjoy the serenity of nature and a quiet bike ride.

Travelling is a bit different today in Nashua. While cars make life a great deal more convenient for many of us, a number of our streets are not as vibrant or chaotic (depending on your perspective) as they once were. Some of the City's shopping or residential areas are just plain difficult or unpleasant to walk or bicycle in. The Willows, the old pastoral area that attracted cyclists, is today a heavily developed commercial strip that even the most fearless pedestrians and cyclists avoid.

However much of Nashua has changed, shared or Complete Streets remain in our bones. From its earliest days, travelers of all stripes– including those on feet, wheels and rails– have converged and jockeyed for space on Nashua's streets. For the City, Complete Streets don't represent new ideas as much as a tribute to our past – and with residents and businesses increasingly appealing for more travel options – it is a key part of our future.


MERCHANTS
"Intricate minglings of different uses in cities are not a form of chaos.
On the contrary, they represent a complex and highly developed form of order."
FUNCTIONS
MARTHA'S EXCHANGE
CASUAL DINING
BREWING COMPANY
Jane Jacobs, 1961

the Nashua Plan4Health project

The Plan4Health grant was awarded to the Northern New England Chapter of the American Planning Association (NNECAPA) as part of a 15-month program called "Plan4Health," a new initiative led by APA's Planning and Community Health Center program to improve capacity of planning and public health professionals in working to advance community based strategies that improve health. The grant supports efforts to improve access to physical activity and nutritious foods.

Guided by the understanding that how a community is designed has a direct effect on the health of its citizens, the funding is allowing APA, for the first time, to offer monetary resources to promote public health by integrating planning and public health efforts in 18 communities across the U.S., including Nashua. The program is implemented in partnership with the American Public Health Association (APHA) and represents a major new collaboration between planners and public health professionals. Funding for Plan4Health was provided through a grant from the Centers for Disease Control and Prevention (CDC).

This funding has enabled the City of Nashua, Nashua Regional Planning Commission, New Hampshire Public Health Association (NHPHA) and Healthy Eating Active Living (HEAL NH) to advance community-based strategies to provide for equitable access to physical activity for people who live, learn, work, or play in the Greater Nashua area.

Members of the Plan4Health Nashua coalition met with Nashua's Mayor on the steps of City Hall to discuss Complete Streets (above left) and walked the Nashua Heritage Rail Trail to review opportunities to improve pedestrian and bicycling access and safety (above right). Photos by NRPC.

The Plan4Health program builds on a strong multi-agency foundation in

Nashua and has a successful history of working collaboratively with HEAL NH and other organizations and individuals to improve health in the Greater Nashua Area through its Community Health Improvement Plan (CHIP).

Recent examples of that collaboration include the Nashua Division of Public Health and Community Services leading a 2-year project, supported by HEAL NH, an initiative of the Foundation for Healthy Communities, and other organizations, to improve access to healthy food and physical activity in the Tree Streets Neighborhood. Several initiatives along the Heritage Rail Trail in Nashua included new lighting, community gardens, colorful building murals, wayfinding and cleanup of overgrown areas along the trail.

"This is the kind of funding that helps our city build on the existing efforts to provide a safe and healthy community environment in all Nashua neighborhoods," said Nashua Community Development Division Director Sarah Marchant. "We have strong working partnerships already, across our city departments as well as in Nashua's business and non-profit communities, and this funding will strengthen our connection with NNECAPA and the NHPHA and will add to our collaborative opportunities."

The Members of the Plan4Health Nashua coalition met in October 2016 to discuss efforts to support Complete Streets in Nashua. The day began on the steps of Nashua's City Hall when 18 community members from a wide range of organizations met with Mayor Donnalee Lozeau to discuss the City's efforts to make the streets safer and more accessible for pedestrians and bicyclists.

Other meeting attendees included representatives from the Nashua Regional Planning Commission (NRPC), the City of Nashua, Great American Downtown, YMCA, HEAL NH, Police Athletic League (PAL), New Hampshire Public Health Association (NHPHA), Boys & Girls Club of Greater Nashua, NeighborWorks, and other community members.

After meeting with the Mayor, the coalition hit the streets, walking along the Nashua Heritage Rail Trail and through other areas of the City. The group discussed Plan4Health Nashua's Complete Streets Project, what improvements have already been done in Nashua, and other priority areas for improving access to safe walking and bicycling, including streets around the PAL building and the Boys and Girls Club.

The meeting continued at the Nashua Transit System offices to review the Level of Traffic Stress (LTS) data the NRPC had collected about how "friendly" Nashua's streets are for biking and walking. Community partners then reviewed the maps showing the data overlay and provided feedback to ensure accuracy.

"We are very excited to be partnering with this team of organizations who are focused on improving healthier options for area residents. The Y is committed to strengthening the Greater Nashua region with a focus on youth development, healthy living and social responsibility," said Mike LaChance, Greater Nashua YMCA CEO.

While the focus of the coalition's work is on supporting Complete Streets in Nashua, the Plan4Health Nashua project has been recognized regionally and nationally as an example of how community organizations, public health advocates, and government agencies can work together effectively to advance health and community livability and achieve shared goals..

so, what exactly are complete streets ?

As cars grew in popularity in the mid 1900s, they began to occupy more and more of our streets. In some cases, sidewalks and road shoulders were seized for car lanes, and in a dramatic example, Main Street in Downtown Nashua was widened, resulting in the demolition of several commercial buildings. Although car travel remains the dominant manner to get around in the Nashua Region, in recent years many residents and policymakers have begun to question the wisdom of ceding so much, and so many, of our streets to automobiles alone.

In response, a growing chorus of voices is advocating today for Complete Streets, sometimes referred to as shared streets. Complete Streets are designed to accommodate all travel modes, including cars and trucks, but also pedestrians, including those with disabilities, bicyclists, and public transit riders. In short these streets are complete in that they serve all travel modes, and all travelers can access and utilize them safely and comfortably.

Several trends have converged to make Complete Streets a rallying cry both here in the Nashua Region and across the country:

- **Aging Population**

The region's senior population is forecast to swell by 130 percent by 2040. Most seniors outlive their ability to drive.

- **Changing Consumer Preferences**

Nationwide, developers are responding to a shift in consumer and real estate preferences toward more walkable communities. Millennials and empty nesters appear to be driving this trend. More locally, developments like the Nashua Cotton Mill, and proposed mixed-use developments along the Merrimack River in Nashua and surrounding the Merrimack Premium Outlets reflect these trends.

- **Recession-based Reality Check**

The severity of the Great Recession forced many of us to re-evaluate how much we can really afford in housing and transportation expenses. This is especially relevant to Millennials with large student debt.

- **Climate Change**

Motor vehicle travel makes up a significant part of the greenhouse gas (GHG)

emissions tied to climate change. In New Hampshire, auto emissions make up approximately 25 percent of GHG emissions

Public Health Concerns

Nationally, researchers have linked many health conditions, including diabetes, obesity, and asthma both to emissions from automobiles and inactivity related, in part, to a car-dominant lifestyle. Instead of taking time to go for a walk or run on the treadmill, it's often possible to incorporate physical activity into our daily routines by walking to pick up kids at school or riding a bicycle down to the corner store.

Road Diets

Conventional transportation planning and street design may result in roadways and lanes that are wider than necessary, One common strategy to improve the `complete-ness' of a road or street is to place it on a road diet. A road diet typically involves re-allocating space on a street from motor vehicles to more active uses. Often this can be accomplished simply by narrowing travel lanes (which by itself contributes to pedestrian and cyclist safety by reducing vehicle speeds) or by reducing the number of travel lanes.. Road diets can provide space for the following::

- Bicycle Lanes
- Sidewalks
- Sidewalk Buffers
- Street Trees
- On-street Parking
- Medians and/or Turn Lanes

Road diets can be a cost-effective solution to creating Complete Streets and improving traffic safety for all users..

These before and after images from Downtown Concord showcase how dramatically Complete Streets improvements can transform a streetscape. Concord matched federal TIGER funding with city appropriations to narrow North Main Street from four to two lanes and increase pedestrian and bicyclist accommodations.

Complete Streets efforts in NASHUA

Although Nashua does not have an official Complete Streets policy in effect, the City has made strides in recent years to improve pedestrian and bicycle conditions, both on roadways and separated use trails. The Main Street sidewalk reconstruction (pictured to the left), added paver crosswalks, sidewalk gardens, seating, period street lighting, and several other features.

BELOW LEFT: Access to the Nashua River has been dramatically improved via additions to the Riverwalk.

BELOW RIGHT: Temple Street includes ample space for bicycle riders.

BELOW FAR RIGHT: The newly constructed Tara Heights apartment complex includes bike trails and parking.

Complete Streets in nearby cities

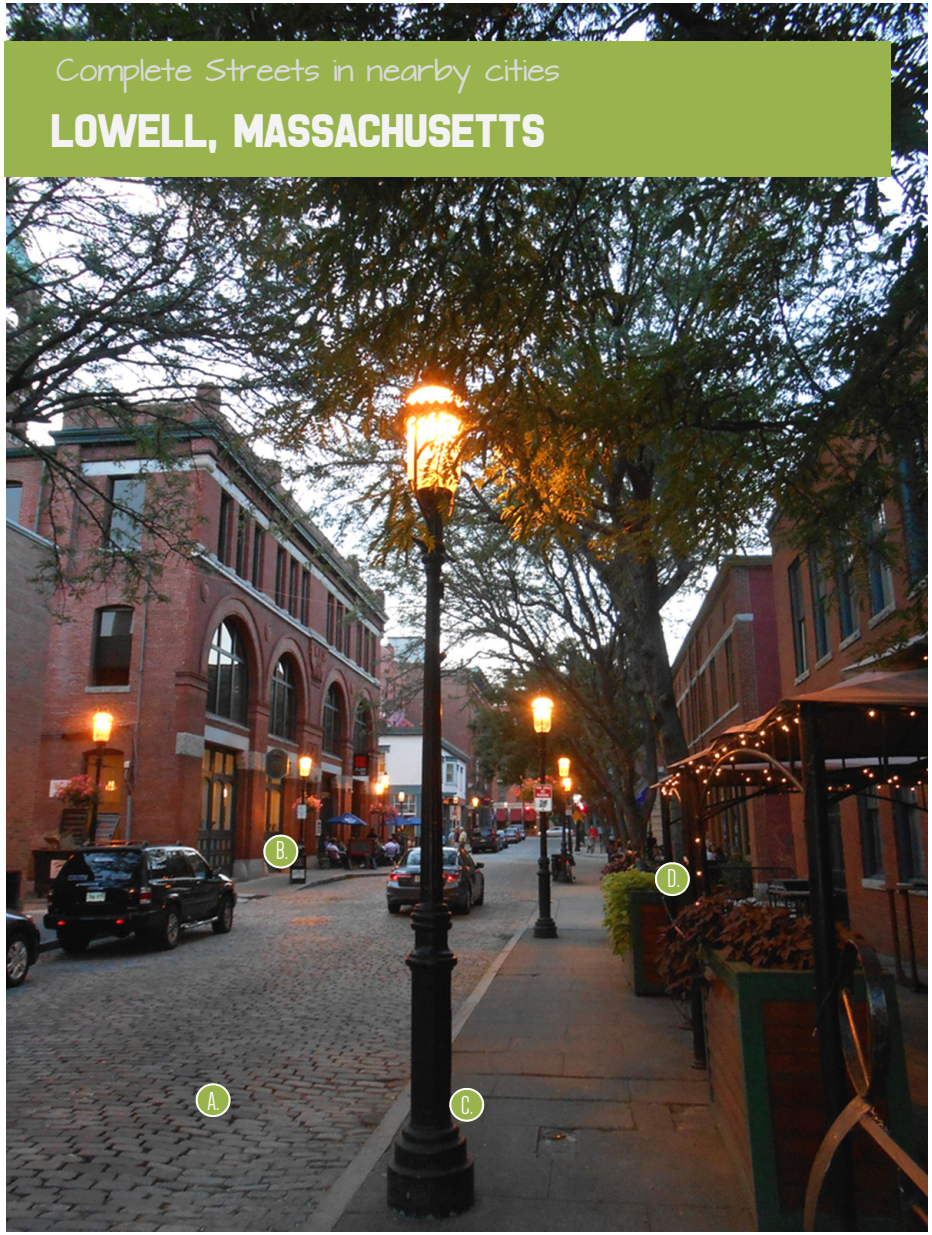
CONCORD, NEW HAMPSHIRE

One hard-to-miss Complete Streets project in New Hampshire is the transformation of Main Street in the heart of Downtown Concord. While the City long recognized that the downtown street needed enhancements, the project received a jumpstart thanks to a federal TIGER grant in the amount of $4.7 million awarded in 2012. The project narrows Main Street from four to two travel lanes, adds a cobblestone street median, and dramatically enhances sidewalk and streetside parking areas. Street furniture has been added as well as period lighting, paver crosswalks and expansive areas for outdoor seating and dining.

Concord's Complete Streets efforts are not limited to Main Street. The City recently received a federal grant to install a boardwalk and trails along the Merrimack River. Additionally, the City has consistently added bike lanes and separated use trails. The League of American Bicyclists began recognizing Concord as a "Bicycle Friendly Community" in 2010.

Complete Streets in nearby cities

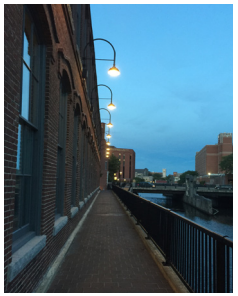
LOWELL, MASSACHUSETTS



Several elements of Palmer Street in Downtown Lowell combine to make for a pedestrian friendly streetscape, including (A.) The use of cobblestone as a roadway surface, on-street parking and the relatively narrow nature of the street, (B.) Buildings oriented to the street with active uses like sidewalk dining, (C.) Context-appropriate and human-scaled street lighting, and (D.) street trees and flower beds. All photos by NRPC.

The City of Lowell has taken steps over the last several years to improve conditions for pedestrians and cyclists. In 2014, the City converted its main downtown streets (including Market, Merrimack and Central Streets) from one-way to two-way with more mid-block pedestrian crossings (top images). In 2013, Father Morrisette Boulevard, which links UMASS Lowell to the downtown area, was reduced from four lanes to two travel lanes with buffered bike lanes and pay station parking added to the roadway (an addition that will help generate new revenue for the City).

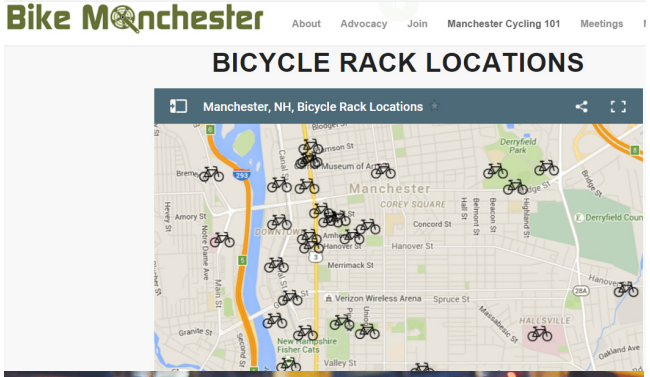
Lowell has also worked to improve access to its waterfront. Canal- and river-walks maintained by the City, state and National Park Service provide waterway access across Lowell. A map of waterside routes is available at: www.nps.gov/lowe/planyourvisit/upload/Lowell-Waterways.pdf



Complete Streets in nearby cities

MANCHESTER, NEW HAMPSHIRE

Manchester's efforts related to Complete Streets development have been aided by the enthusiasm and dedication of several grassroots volunteer groups. The installation of the Irving and Bernice Singer Pedestrian Bridge in October 2015, pictured above, helped link the Piscataquog River Trail to the Goffstown Rail Trail providing a key connection which links Manchester to Goffstown Town Center. Additionally, a newly formed grassroots group, dubbed Bike MHT, has helped improve bicycle conditions in the City through a partnership with the City's Department of Public Works as well as members of the business community. Several businesses have sponsored the construction and installation of distinctive Manchester-branded bike racks, while the City recently began adding bike lanes to several key streets. Finally, the success of the Hanover Street Block Parties, in which a section of Hanover Street is closed to vehicles on Saturdays and outdoor seating is expanded, has proven a boon for businesses. The Union Leader noted that restaurants and bars on the street reported a 20-30 percent jump in business during the events.



TOP and CENTER: Bike Manchester has developed a set of distinctive bike racks to install across Downtown Manchester. The organization also maintains an interactive map of rack locations. BOTTOM: Patrons enjoy a Hanover Street Block Party in the Summer of 2014.

WHAT ARE THE BENEFITS OF COMPLETE STREETS?

improved health outcomes

The issue of obesity in the Greater Nashua Public Health Region is highlighted in the 2011 and 2014 Community Health Assessments. The CDC recommends comprehensive street design measures, such as Complete Streets to promote physical activity and prevent chronic diseases, including heart disease, diabetes and stroke. A 2013 UC-Berkeley study found that kids who lived in a walkable suburban neighborhood enjoyed 46 percent more physical activity than kids living in a traditional suburban area. A 2014 Univ. of Kansas study found that older adults who live in walkable areas stay in better shape, both physically and cognitively, than their peers in car dominant areas.

equity & access to opportunity

The American Dream is predicated on the assurance that all citizens enjoy access to opportunities to prosper and advance. Complete Streets help ensure that residents, of all ages and abilities, and particularly those without access to a car, enjoy equitable access to education, employment, religious and cultural institutions, physical activity, and friends and family.

real estate premiums

A 2013 study found that, on average, residential buyers in both the US metropolitan and micropolitan areas pay approximately $850 more for a house with one additional point in Walk Score. "The [real estate] market signals are flashing pretty brightly: build more walkable, and bikeable, places," one researcher noted.

attract more millennials, empty nesters

A recent Transportation for America survey of young adults concluded "To recruit and keep millennials, give them walkable places with good transit and other options." In New Hampshire, walkable communities like Concord and Dover bucked the state trend and actually attracted an increase in young adults between 2000 and 2012, while less walkable places like Salem and Merrimack saw decreases in the young adult population (US Census 2000 and ACS 2008-2012).

fewer crashes

A 2001 study of car collisions in Strafford County, NH found that crash frequencies were twice as high on streets without sidewalks as those with sidewalks. A 2006 follow-up study found that livability amenities like street trees and outdoor seating were correlated to reduced crash rates.

improved social capital, job growth

A 2010 UNH study found that residents of walkable neighborhoods of Manchester and Portsmouth enjoyed social benefits. "We found that neighborhoods that are more walkable had higher levels of social capital such as trust among neighbors and participation in community events," said Shannon Rogers, lead author of the study. Others have correlated walkable communities with job growth. The City of Portsmouth, often called New Hampshire's most walkable municipality, has added more jobs over the last five years than any other major town or city in the state *(NH Employment Security).*

how do we get there?

design elements for more complete streets

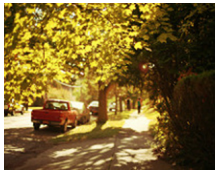
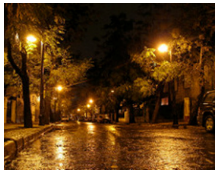
Designing Complete Streets means that planned streets contribute to a safe, convenient and comfortable travel experience for all users. Prior to selecting a set of treatments for a street, it is important to first understand who the different (existing and potential) user groups are. Street typologies and supporting design standards can help to better understand the intended users of specific streets, and the type of design that is warranted. Other data that should be considered when choosing the most appropriate design treatments for a Complete Streets project include (City of New Haven 2010):

- High speeds are incompatible with pedestrian and bicycle environments.
- Existing non-motorized volumes.
- Major trip generators, such as schools, libraries, transit centers, mixed use centers, hospitals, etc.
- Crash data: Higher numbers of injury or fatality crashes indicate the need for bicycle and pedestrian improvements and traffic calming measures.
- Street classification and type.
- Other data such as transit use, school walking routes, etc.;.

Other factors, such as right-of-way constraints, community desires, existing and planned land uses, and available budget, also need to be considered when choosing a design for the street. Once a conceptual understanding of the needs, uses and relative constraints of a street have been determined, there are several design strategies that can be utilized to create Complete Streets. In retrofit projects, one particularly effective strategy for allocating space for the types of treatments is through the re-channelization of a roadway (also called a road diet).

Complete Streets Toolbox

The following "toolbox" includes examples of bicycle, pedestrian and transit friendly designs. However, the types of designs chosen for a specific street or project should reflect a variety of factors, including adjacent land use, traffic volumes and speeds, intended users and right-of-way constraints. The toolbox is presented to illustrate the myriad of options for cities to consider when designing Complete Streets.

	DESIGN ELEMENT	DESCRIPTION	COSTS CAPITAL	COSTS MAINTENANCE
1	curb extensions	Curb extensions reduce pedestrian cross times and exposure to motor vehicles, increase visibility, encourage appropriate motor vehicle operating speeds and create public space and enable placement of street furniture—essential elements for an active street life.	$	$$
2	 street trees	Street trees provide a buffer between the sidewalk and adjacent motor vehicle travel lanes; add a frame of reference to the roadway, encouraging the driver to proceed at appropriate speeds; as well as provide shade and gathering places.	$	$
3	 lighting	Studies have shown that the presence of lighting not only reduces the risk of traffic crashes, but also their severity. Gresham Smith and Partners 2009, 31).	$$	$$
4	sidewalk widening	Wider sidewalks provide separation between pedestrians and adjacent travel lanes, create space for people to congregate and allow the placement of fixed objects — street trees, lighting, street furniture, etc.	$$$	$$
5	ADA curb ramps	Access for all users is an important part of any Complete Street. Per ADA guidelines, wheelchair ramps with detectable warning strips should be installed wherever a sidewalk crosses a curb, and existing ramps should be upgraded to meet current ADA guidelines.	$	$

	DESIGN ELEMENT	DESCRIPTION	COSTS CAPITAL	COSTS MAINTENANCE
6	street furniture	Functional and aesthetically pleasing street furniture contributes to a pleasant walking environment and supports the use of the street as a public space.	$$	$$
7	crosswalks	Crosswalks should generally be installed at controlled intersections and should be placed to minimize crossing distances and conflicts between pedestrians and vehicles. Midblock crosswalks on arterials and collector roads should be considered as needed, subject to traffic studies and engineering judgment.	$	$
8	sidewalk surface treatments	Alternative materials such as brick or stone pavers or even tinted concrete can be used for aesthetic enhancements that contribute to a pleasant walking environment, as well as to improve stormwater control through permeability.	*Costs vary depending on material. Stamped concrete or asphalt is much less expensive than pavers.*	
9	roadway surface treatments	Roadways are typically paved in asphalt or concrete. However, other surface treatments such as pavers or stamped/ imprinted concrete or asphalt may be used in certain locations to enhance aesthetic character, improve stormwater control through permeability and/ or delineate space for various street users.	*Costs vary depending on material. Stamped concrete or asphalt is much less expensive than pavers.*	
10	pavement markings	A variety of pavement markings can be employed to improve street safety and functionality for all road users. Some examples include directional arrows, school zone warning signs and stop bars.	$	$

	DESIGN ELEMENT		DESCRIPTION	COSTS CAPITAL	COSTS MAINTENANCE
11		speed tables	A speed table is a raised area in the roadway pavement surface that can help reduce speeds. Speed tables are most effective when used in combination with other traffic calming/speed reducing measures and they are not suitable for all locations.	$$	$
12		refuge islands	Islands enhance pedestrian safety and accessibility on streets with two-way traffic by reducing crossing distances and providing refuge for pedestrians to cross one direction of traffic at a time.	$$	$$
13		chicanes	A chicane shifts traffic from one side of the street to the other through the use of staggered curb extensions or a serpentine roadway alignment. Chicanes discourage or make it impossible for drivers to drive in a straight line, which can reduce vehicular speeds. Chicanes may also be created by staggering on-street parking. Impacts on drainage, street sweeping and snow clearance must be addressed in any chicane design.	$$	$$
14		curb bump outs	A curb bump-out is an extension of the sidewalk to the edge of the vehicle travel lane. It is used at transit stops so that a bus can board and de-board passengers without having to exit and reenter traffic at every stop. This adds more efficiency and speed to stops where there are curb bump-outs.	$	$

	DESIGN ELEMENT		DESCRIPTION	COSTS CAPITAL	COSTS MAINTENANCE
15		bicycle lane	Bicycle lanes are marked spaces along length of a roadway for use exclusively by bicyclists. Bike lanes create a separation between cyclists and motor vehicles.	$	$
16		cycle track	A cycle track is an exclusive bicycle facility adjacent to—but separated from—the roadway by a physical barrier.	$$	$
17		multi-use trail	A multi-use trail is a separated non-motorized facility, often used for recreation or commuting purposes by cyclists and pedestrians.	$$$	$$
18		buffered bike lane	A buffered bicycle lane is a bike lane with a marked (often hatched) buffer to increase the separation between bicycles and motor vehicles.	$$	$
19		advisory bike lane	Advisory bicycle lanes are dotted white lines on both sides of a narrow roadway to delineate bicycle areas. They are in areas where bicycles and cars must cross paths. Motorists may enter the bicycle zone when no bicycles are present.	$	$

	DESIGN ELEMENT	DESCRIPTION	COSTS CAPITAL	COSTS MAINTENANCE
20	colored bicycle lane	Color is applied to the bike lanes to distinguish the bike lane, alert roadway users at high-conflict areas and to clearly assign right-of way to cyclists. Motorists are expected to yield to cyclists in these areas.	$	$
21	contraflow bike lane	Bike lanes placed on a one-way street, with bicycle travel flowing in the opposite direction as car travel. They are commonly used on one-way auto traffic streets and narrow streets where on-street parking and bicycle accessibil-ity are given priority over traffic accessibility.	$$	$$
22	bicycle boulevard	A shared roadway where the bicycle, or any other human-powered vehicle, is the primary design vehicle. Bike boulevards are commonly used on low traffic residential streets parallel to a proximal arterial.	$$	$
23	shared lane markings (sharrows)	Markings used to indicate a shared lane envi-ronment for bicycles and automobiles. Sharrows increase the visibility of the roadway as a valid place for bicycle traffic.	$	$
24	bicycle signals	Traffic signals specifically designed for bicyclists.	$$	$

	DESIGN ELEMENT	DESCRIPTION	COSTS CAPITAL	COSTS MAINTENANCE
25	paved shoulder	A paved shoulder refers to the part of the roadway that is adjacent to and at grade with the vehicle travel lane. Paved shoulders for bicycle use are not typically provided on roadways with curb and gutter, but rather on roadways where there is a need to more safely accommodate bicycles. On rural roadways where bicycle travel is common, such as roads in coastal resort areas, wide paved shoulders are highly desirable (North Carolina Department of Transportation).	$	$
26	bicycle box	Bicycle boxes (a form of “advanced stop line”) are a traffic control device at signalized intersections that require motorists to stop a short distance before the crosswalk and allow bicyclists to stop in the area between the cars and the crosswalk.	$	$
27	Bicycle parking	Bicycle parking is typically divided into four types of categories: 1) short-term public parking; 2) long-term public parking; 3) short-term private parking and 4) long-term private parking. Complete Streets should provide enough secure public bike parking to meet demand in that area.	$	$
28	bicycle signage (wayfinding)	Bicycle wayfinding signage is used to direct cyclists to certain areas of the community, common attractions and through parts of town that might be difficult to navigate on a bicycle.	$	$

	DESIGN ELEMENT		DESCRIPTION	COSTS CAPITAL	COSTS MAINTENANCE
29		roundabouts	A bicycle roundabout is the use of a circular intersection conforming to modern roundabout standards to organize the interaction of bicycles (and automobiles) where bicycle boulevards or off street pathways intersect. They are commonly used where two bike boulevards or shared use pathways cross.	$$$	$$
30		transit shelters	Transit shelters are covered structures located at bus stops. The purpose of these structures is to provide protection from weather elements for people waiting for buses. Transit shelters often have benches and trash receptacles, but recently solar powered lighting and real-time bus information systems are being added to transit shelters as well to enhance customer experience.	$$	$
31		bus-only lanes	Bus lanes give priority to buses and cut down on journey times where roads are congested with other traffic. A bus-only lane is not necessarily very long, as it may only be used to bypass a single congestion point such as an intersection.	$	$
32		sidewalks	Sidewalks are paths made specifically for pedestrians on the side of a roadway, usually paved.	$	$

green streets

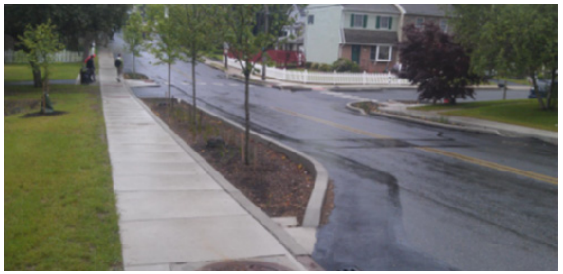
good for the environment and cost-effective for communities

Many elements of street design, construction, and operation can work in favor of achieving both Complete Streets that work for all travelers and 'Green Streets' that help deliver environmental sustainability.

Traditional street design often looks to remove stormwater runoff as quickly as possible, rather than allowing it to drain directly into the ground. This can result in negative environmental impacts associated with both stormwater quality and quantity, like polluted runoff, sedimentation, and bank erosion.

Green Street technologies help to replicate and restore the natural hydrologic cycle and reduce the volume of stormwater entering the sewer system by improving infiltration, evaporation, transpiration and the capture and reuse of rainfall. Green Street infrastructure seeks to maximize permeable surfaces, tree canopy and landscaping elements in order to:

- Divert stormwater from the sewer system,
- Reduce polluted stormwater from entering rivers and streams,
- Reduce impervious surface so stormwater can infiltrate to recharge groundwater and surface water,
- Increase urban green space,



- Improve air quality and reduce air temperatures,
- Reduce demand on sewer collection system and the cost of constructing expensive pipe systems, and,
- Address requirements of federal and state regulations to protect health and restore and protect watershed health.

A 2013 UNH study concluded that low impact development stormwater practices do not incur any additional maintenance costs. Making our transportation system more sustainable involves many policies and practices that minimize environmental impact and create streets that are safe for everyone. Complete Streets are a natural complement to sustainability efforts, ensuring benefits for mobility, community, and the environment without adding significant new costs for communities.

unfortunately, we don't live in this world

unless that Powerball thing works out

capital and maintenance costs for complete streets

Capital and public works budgets are persistently tight and generally have very limited funding available to implement Complete Streets improvements.

Fortunately, many Complete Streets improvements cost very little, or nothing, and can often save municipalities money over the long-term. One important mechanism is to have a Complete Streets policy in place and to evaluate every road project for possible Complete Street elements and incorporation very early in the planning process. This prevents costly revisions to plans down the road. Having design guidelines in place can ensure that Complete Streets elements are incorporated into new projects without forcing planning and consulting staff to do extensive design research. In some cases where cities and states have built infrastructure without properly accounting for pedestrians and cyclists, engineers have had to revisit the project after it has been built and add expensive facilities for such users when previous conditions proved unsafe.

Other improvements related to Complete Streets are very low cost or add virtually no cost to projects. Adjustments in pedestrian timing signal times to allow for longer crossing phases is an adjustment that costs virtually nothing in capital and operating costs. When incorporated into Complete Streets projects, low impact development practices both benefit the environment and have been found to incur no additional maintenance costs. (.Houle et al., 2013) Road diets can often be accomplished simply by repainting lane markings and in some cases can create room for on-street parking, which if metered, allows for a new revenue stream..

A road diet implemented in 2013 along Father Morisette Boulevard in Lowell allowed for the incorporation of buffered bike lanes as well as pay station parking, an addition which helped generate new revenue for the City and more than made up for the construction costs. Photo by Bing.com.

In coordination with the development of this guidebook, an audit was undertaken to review Nashua long-range plans and regulatory codes to review how well they support the development of Complete Streets in the City of Nashua. This land use audit also helped identify gaps in plans and codes or areas that might be in conflict with the goal of developing a more bicycle and pedestrian friendly street network.

The audit focused on five core areas:

Safety

Transportation

Land Use

Design

Site Specific

A series of plans and regulatory documents were reviewed, including:

Nashua Land Use Code

Code of the City of Nashua

Roadway and Sidewalk Design Standards

City of Nashua Master Plan

Downtown Master Plan

East Hollis Street Master Plan

Tree Streets Plan

The audit offered a number of recommendations related to the expansion of Complete Streets goals in the City. The audit recommends that the City implement more expansive requirements on new developments and redevelopments along mixed-use corridors outside the Downtown area (including Route 101A and the Daniel Webster Highway). It recommends updating the city's specifications for road and sidewalk construction to be more supportive of Complete Streets efforts. It also recommends consolidating neighborhood-level master plans to improve the likelihood of implementing long-term recommendations.

developing a level of traffic stress (LTS) index

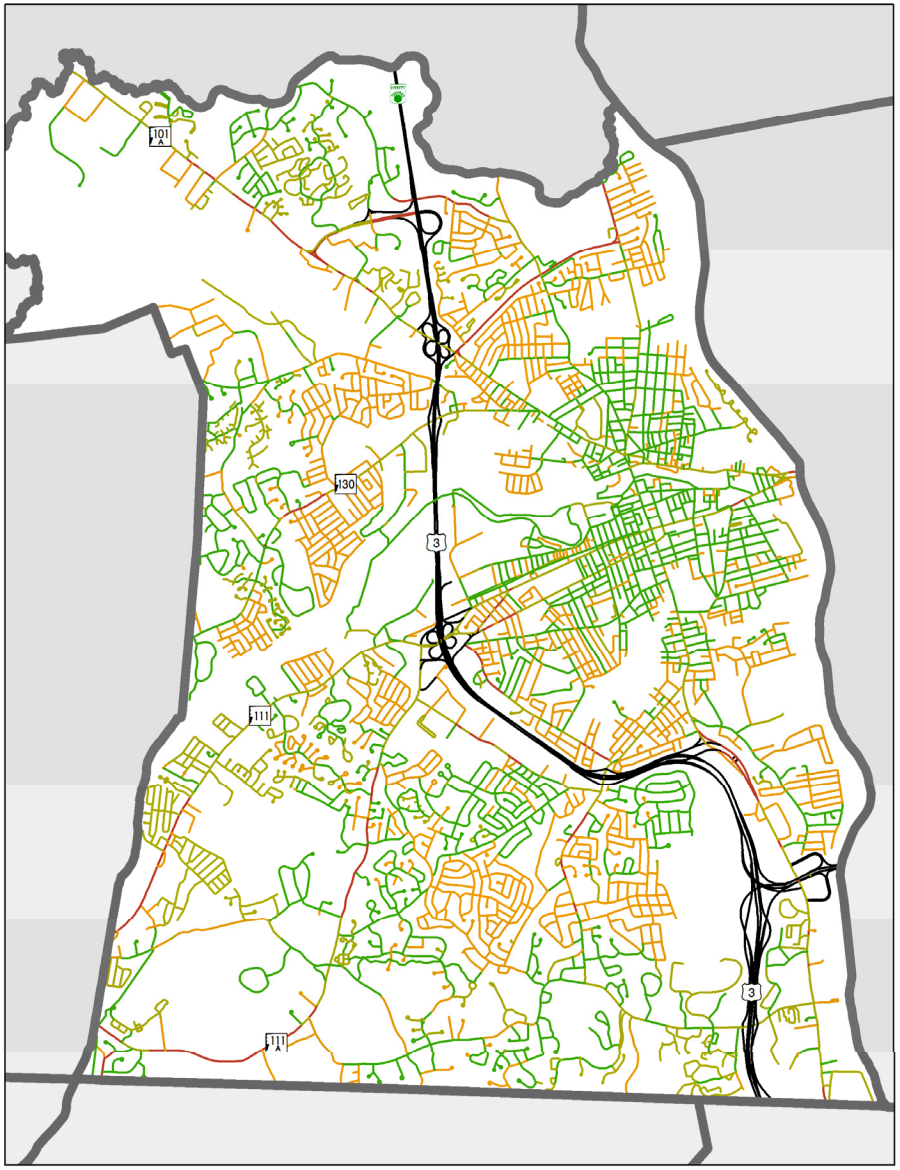
To conduct the analysis that shows potential areas of improvement, every street in Nashua was assigned a Level of Traffic Stress (LTS) for bicycling and a Level of Walkability (LoW) for pedestrian travel.

The methodology for Level of Traffic Stress has been used in a handful of larger metropolitan areas across the U.S and recently, several communities in New Hampshire, including Nashua, have developed a network of LTS scores through a NHDOT pilot project. LTS is intended to analyze the comfort of bicyclists with varying experience levels depending on the physical characteristics of a street. The scores range from 1 (suitable for all bicyclists, including children) to 4 (suitable for only the most fearless and experienced rider), and are determined by a formula that incorporates bike lanes, shoulders, lane width, traffic speed, on-street parking, and more.

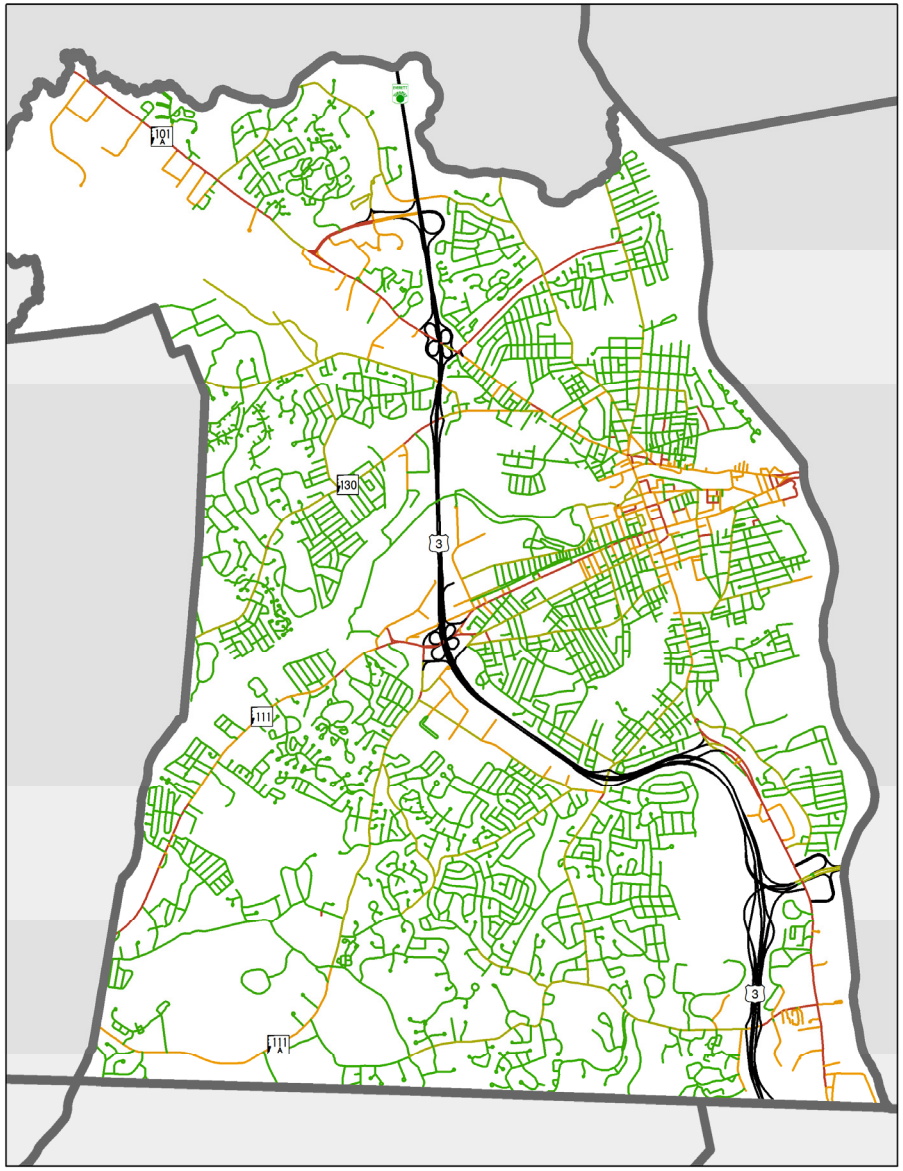
For pedestrians, project team leaders developed a separate formula that has some similarities to LTS, using attributes such as the presence of sidewalks, any buffer area between a sidewalk and the street, shoulder width, and traffic speed. Walkability scores also range from 1 to 4, but are meant to be more of a relative index than representative of specific levels of ability like the bicycle LTS system.

Preliminary scores for both biking and walking were taken to team meetings and various public outreach events, where project team members took feedback on specific routes. The goal here was to develop a list of streets where the physical attributes of the road may not represent the true on-the-ground feeling of comfort by a user. Factors such as safety, visual cues, terrain, and amenities were considered. These factors, while not affecting the scores produced by the formulas, are taken into consideration in the analysis when looking at potential areas of improvement.

LEVEL OF PEDESTRIAN WALKABILITY



LEVEL OF BICYCLE TRAFFIC STRESS



The maps above indicate Level of Pedestrian Walkability (LEFT) and Level of Bicycle Traffic Stress (RIGHT). Green indicates street segments found to be the most walkable or the least stressful, yellow and orange indicate middle scores, and red highlights the least walkable or most stressful segments.

Several factors that are known to influence pedestrian and bicycle travel but that may be difficult to measure quantitatively are not included in the LTS analysis for either walking or bicycling..

These factors include:

- **Aesthetics and amenities**

Pedestrian and cyclist levels are often highest in attractive and vibrant neighborhoods and communities with wider access to amenities. The aesthetics of a place can factor significantly in how pedestrians and cyclists perceive a place and thus directly impacts comfort levels.

- **Safety from crime and perceptions of safety**

Pedestrians and cyclists are likely to avoid areas with higher crime rates. Perceptions dictate travel behaviors as well. Pedestrians and cyclists might avoid certain areas that feel unsafe or have a reputation in the community as being crime prone, even when such perceptions are exaggerated or unfounded.

- **Lighting**

A high proportion of collisions occur in low light conditions. Pedestrians and cyclists are more likely to travel in well lit areas.

- **Terrain**

Pedestrians, and particularly cyclists, are sensitive to changes in terrain and topography. Poorly maintained sidewalks and roadways present a veritable obstacle course for pedestrians and cyclists and they are likely to take steps to avoid such areas.

- **Traffic Volumes**

Although traffic volumes are quantifiable for some locations, they are not available for all street segments. However, higher traffic volumes do directly impact pedestrian and cyclist safety and perceptions of comfort and safety. There is a higher likelihood that

To help determine where Complete Streets improvements would have a positive impact on the most people in need, NRPC looked at various sets of demographic and transportation data to find potential hot spots for bicycle and pedestrian trips.

For origins, an index score was calculated for each Census block in Nashua using the following attributes from the 2010 Census, American Community Survey, and NRPC parcel data:

Household income

Youth population

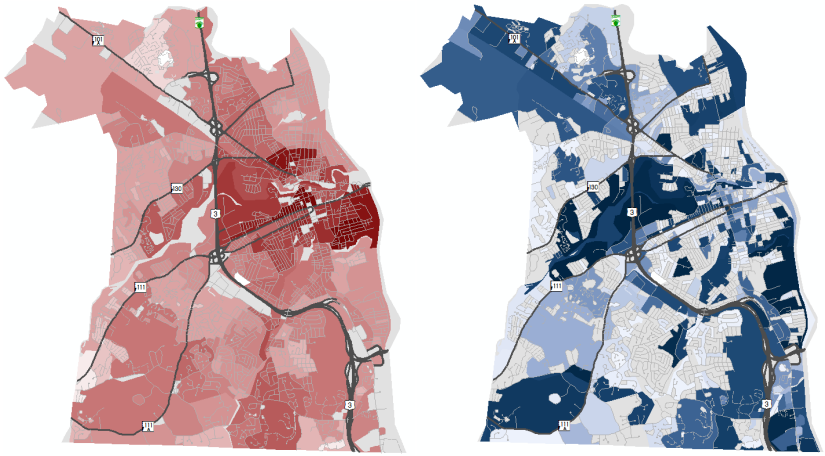
Vehicle availability

Commute choice

Commute length

Proximity to a school

Similarly, Census blocks were given destination scores based on the attributes of school enrollment, parks and recreation sites, employment sites, and bus stop ridership.

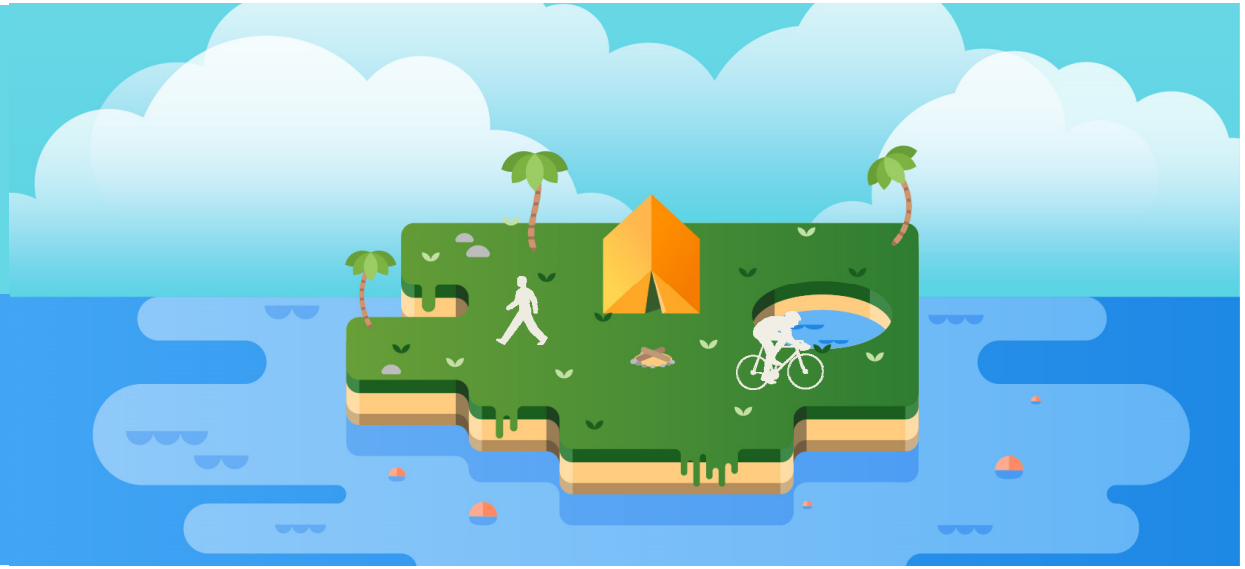


Origin (left) and destination (right) scores for Census blocks in Nashua. Darker colors represent more likely areas for biking and walking trips .

The blocks of Nashua with high origin and/or destination scores became the focus areas for existing network connectivity analysis.

"Wealth is not about having a lot of money. It's about having a lot of options."
Chris Rock

connectivity islands



Looking at a map of Nashua streets, symbolized by their Level of Traffic Stress or Level of Walkability, patterns begin to emerge. Quiet neighborhoods and stressful corridors stand out. Finding these corridors and broken connections along high-demand routes can lead to recommended complete streets improvements in order to safely get walkers and bicyclists where they want to go.

To find these gaps, NRPC used GIS analysis to develop connectivity islands - the contiguous networks of travel using only street segments with an appropriate level of stress. In other words, how far can you go without feeling unsafe? Which destinations are available? Which ones are just out of reach?

The concept of connectivity islands came to NRPC from *Low-Stress Bicycling and Network Connectivity, a case study for San Jose, California* published by the Mineta Transportation Institute.

The maps on the following pages focus on this methodology. For each target study area in the City, NRPC used its demographic data findings (see preceding page) and selected a point of origin (dense residential areas with large walking and biking populations) or a likely destination (schools and parks) from which to analyze connectivity and a particular LTS or LoW to avoid in the scenario. Available street segments are shown in one color, often displaying a neighborhood or destination completely cut off from the rest of the City due to its location along an unsafe corridor.

From there, streets that could be improved to decrease stress levels are listed, and the same map shows the areas that may open up due to such improvements in another color. This helps answer the questions, "NOW where can you go?" or "NOW who can come here?"

This analysis can be conducted from any point in Nashua, so that any future projects can be modeled for their potential effectiveness and reach.

Bronstein Apartments

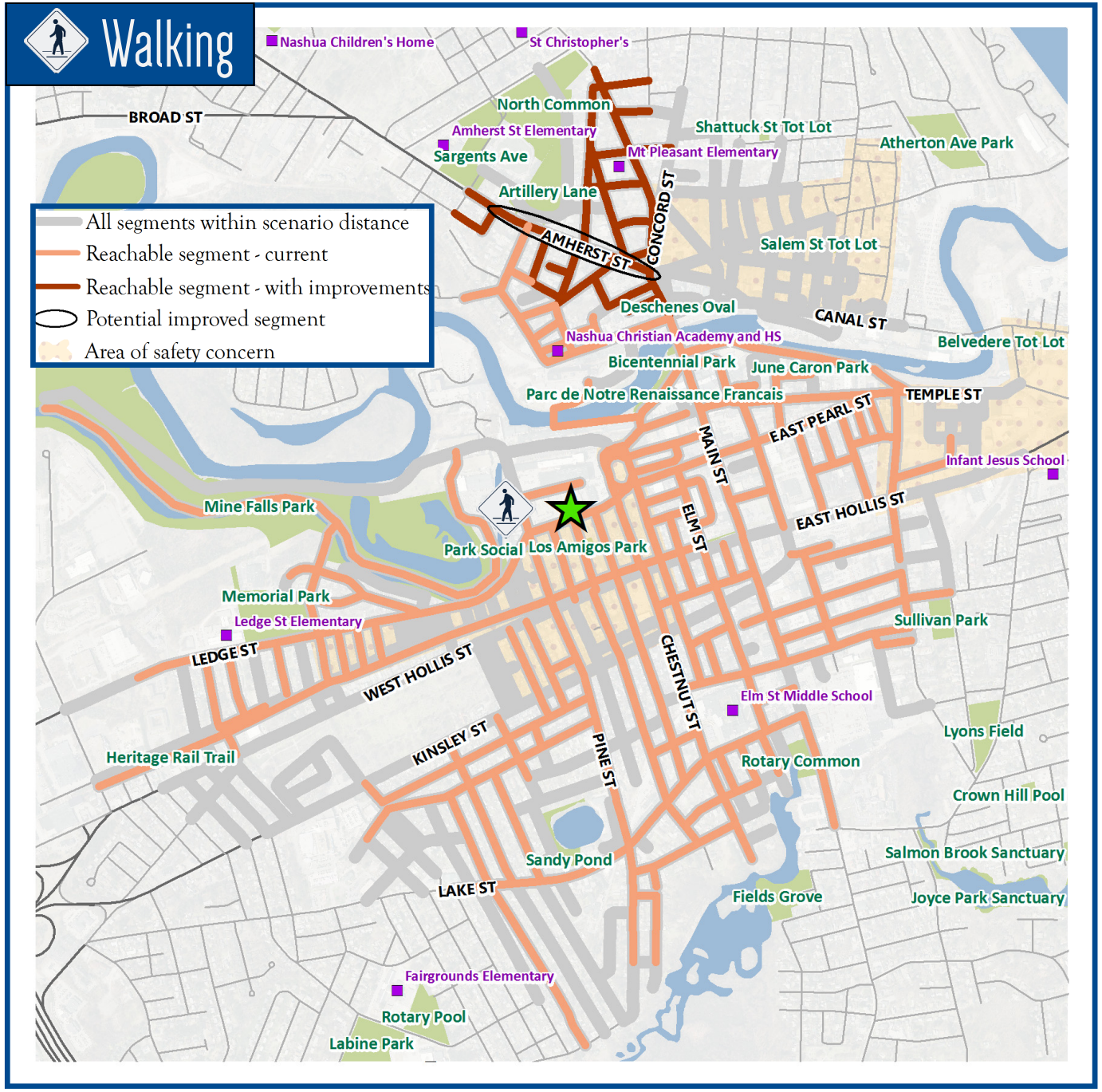
Accessibility within one mile

In this map, the gray lines represent the areas of the City accessible within one mile for a walker departing from Bronstein Apartments, regardless of the Level of Walkability (LoW). The orange lines represent where that person could go without using a street segment with a LoW greater than 1.

The maroon lines represent new areas open to that same person provided that the following streets or segments were improved using Complete Streets techniques or other improvements:

- Amherst Street (from Holman Stadium to Main Streeet)

Such improvements would lead to greater accessibility to recreational opportunities north of the Nashua River, such as Holman Stadium and Greeley Park.



Bronstein Apartments

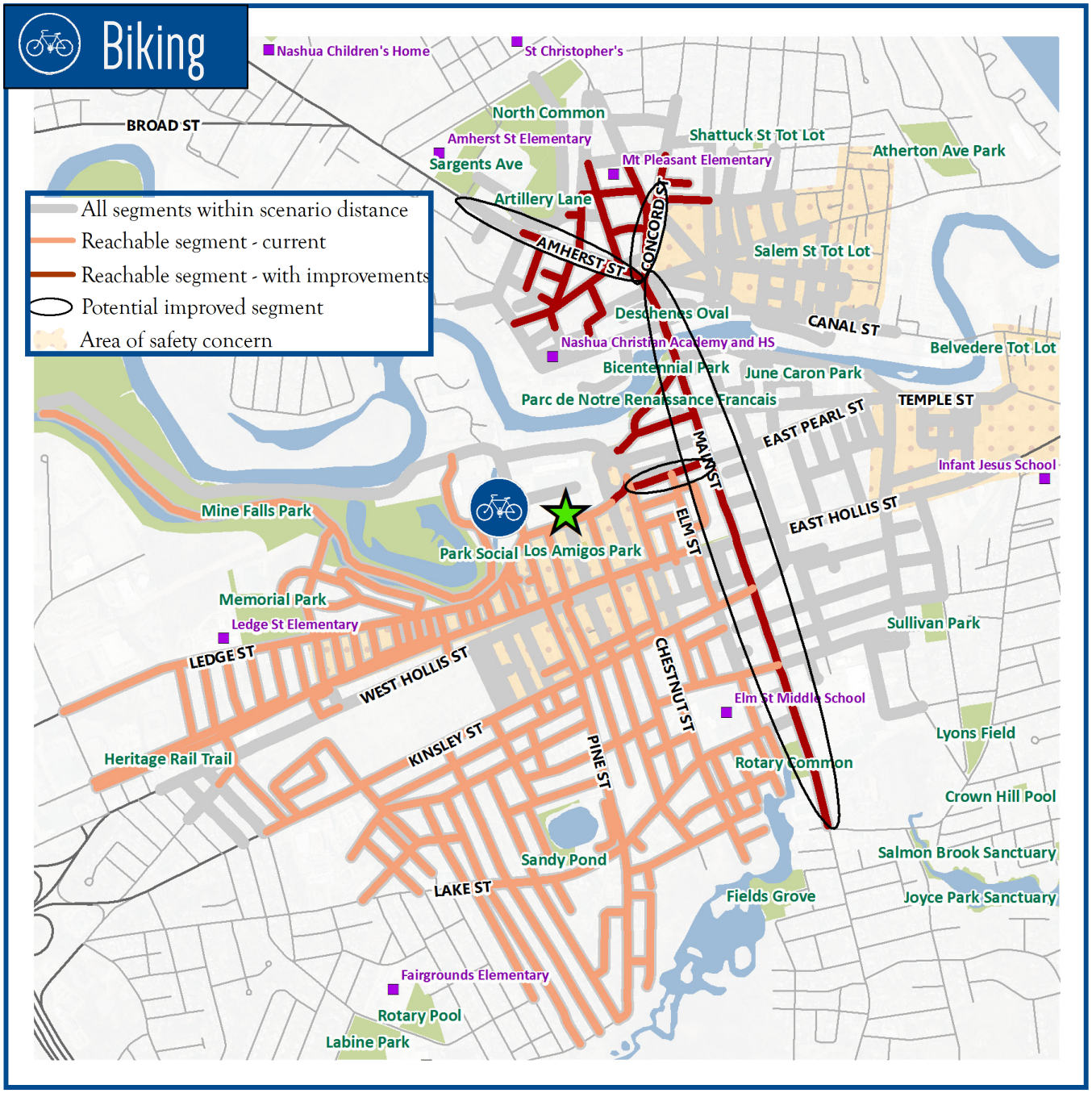
Accessibility within one mile

In this map, the gray lines represent the areas accessible within one mile for a recreational adult cyclist departing from Bronstein Apartments, regardless of Level of Stress (LTS) indices. The pink lines represent where a cyclist could go without riding on streets that have been found to be stressful for recreational adult cyclists (LTS 3-4).

The maroon lines represent areas where the cyclist could comfortably ride provided the following streets were made more bikeable under a Complete Streets framework:

- East Pearl Street
- Main Street
- Amherst Street
- Concord Street
- Manchester Street

Such improvements would dramatically improve accessibility to areas of the City north of the Nashua River including Greeley Park.



Dr. Crisp School

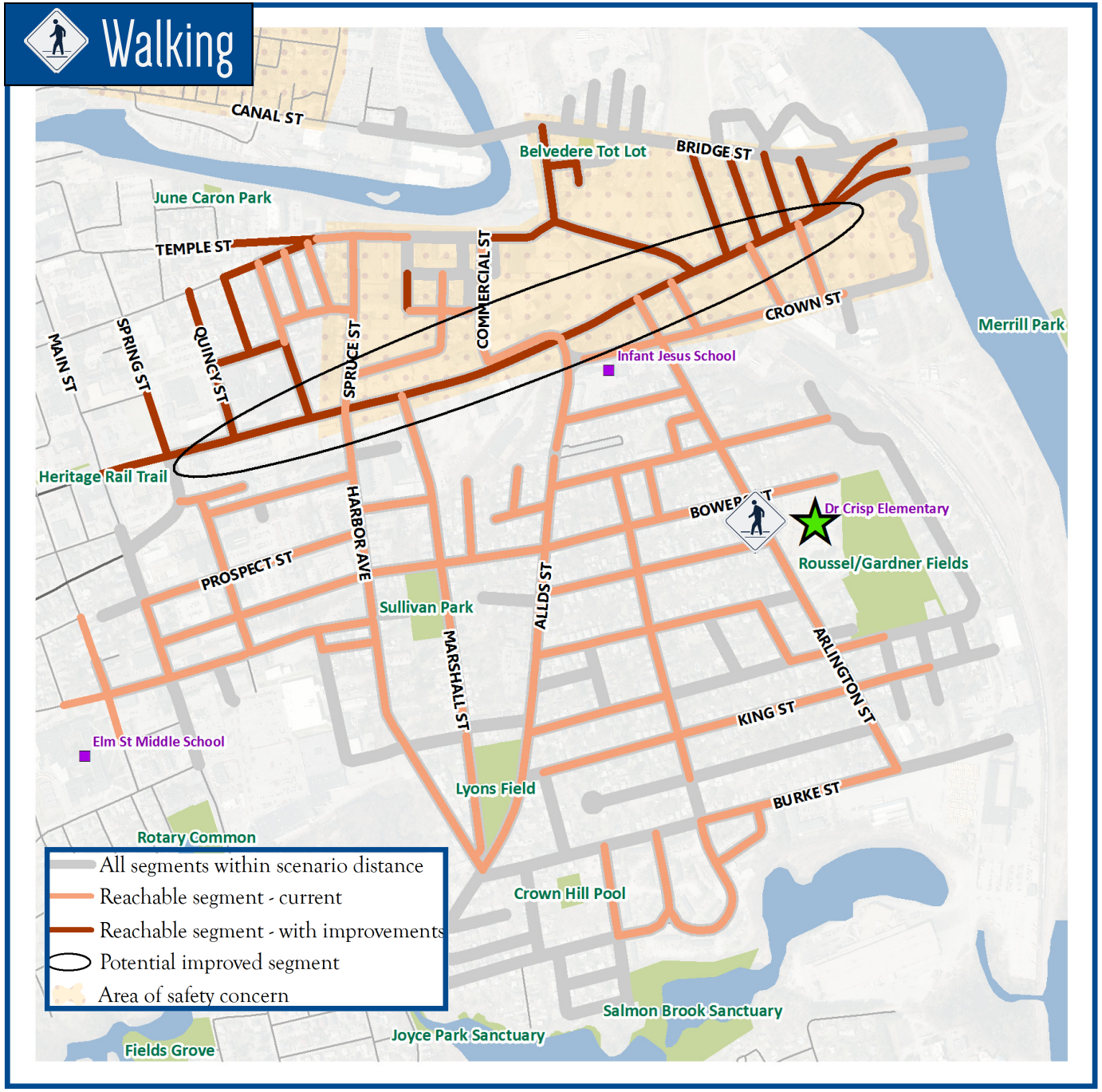
Accessibility within one mile

In this map, the gray lines represent the areas of the City accessible within one mile for a walker departing from Dr. Crisp Elementary, regardless of the Level of Walkability (LoW). The orange lines represent where that person could go without using a street segment with a LoW greater than 1, possibly unsafe for a child walking to and from school.

The maroon lines represent new areas open to that same person provided that the following streets or segments were improved using Complete Streets techniques or other improvements:

- East Hollis Street

Improving East Hollis St would not only increase accessibility to the residential and commercial sites along the street itself, but also open up the neighborhoods to the north towards Canal St, where a significant population of Dr. Crisp students make their home.



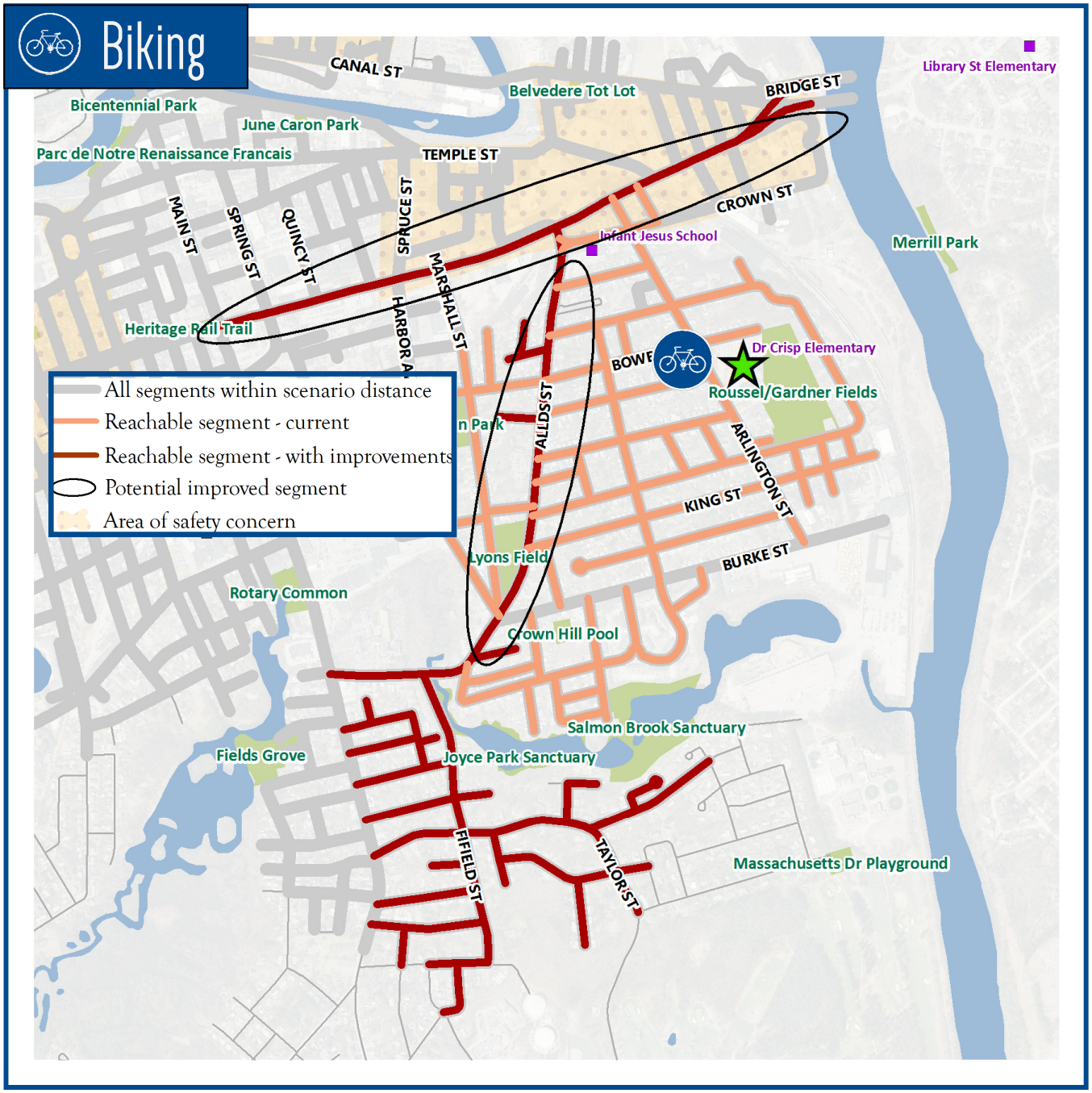
Dr. Crisp School

Accessibility within one mile

In this map, the gray lines represent the areas of the City accessible within one mile for a bicyclist departing from Dr. Crisp Elementary, regardless of the Level of Traffic Stress (LTS). The orange lines represent where that person could go without using a street segment with a LTS greater than 1, too stressful for a child on a bike. The maroon lines represent new areas open to that same person provided that the following streets or segments were improved using Complete Streets techniques or other improvements:

- East Hollis Street
- Allds Street

Such improvements would not only increase accessibility to the residential and commercial sites along the two improved streets, but also open up the neighborhoods to the south of Allds Street towards South Main Street.



Greeley Park

Accessibility within one mile

In this map, the gray lines represent the areas of the City accessible within one mile for a walker coming to or going from Greeley Park, regardless of the Level of Walkability (LoW). The orange lines represent where that person could go without using a street segment with a LoW greater than 1. In this analysis, there are 2 entrance points to the park – off Concord St and Manchester St.

The maroon lines represent new areas open to that same person provided that the following streets or segments were improved using Complete Streets techniques or other improvements:

- Concord Street (north of Beasom St and south of Courtland St)
- Manchester Street (north of Hills Ferry Rd)

Such improvements would lead to greater accessibility for the dense residential neighborhoods to the north and south of Greeley Park. It is important to note that most of the streets still in gray are only inaccessible due to lack of sidewalks. In reality, many of these areas see little vehicle traffic and are likely less stressful than their scores would indicate.

Greeley Park

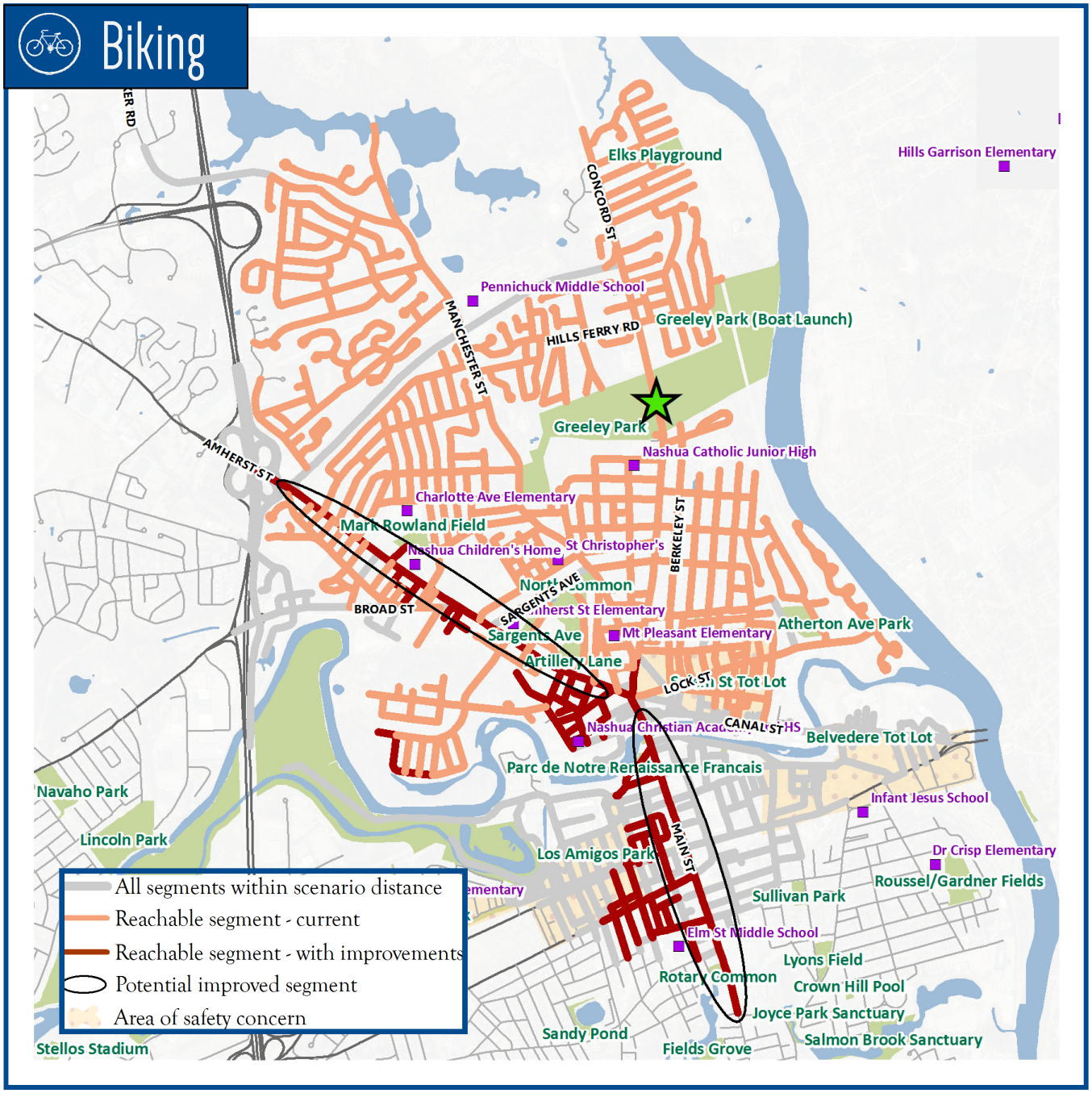
Accessibility within two miles

In this map, the gray lines represent the areas of the City accessible within two miles for a bicyclist coming to or going from Greeley Park, regardless of the Level of Traffic Stress (LTS). The orange lines represent where that person could go without using a street segment with a LTS greater than 2.

The maroon lines represent new areas open to that same person provided that the following streets or segments were improved using Complete Streets techniques or other improvements:

- Amherst Street
- Main Street

Such improvements would lead to greater accessibility not only to and from the commercial and residential sites along the corridors themselves, but also to the dense neighborhoods south of the Nashua River, particularly in target study areas such as the Tree Streets. Longer bike trips could then connect Greeley Park to Mine Falls and beyond.



Royal Crest

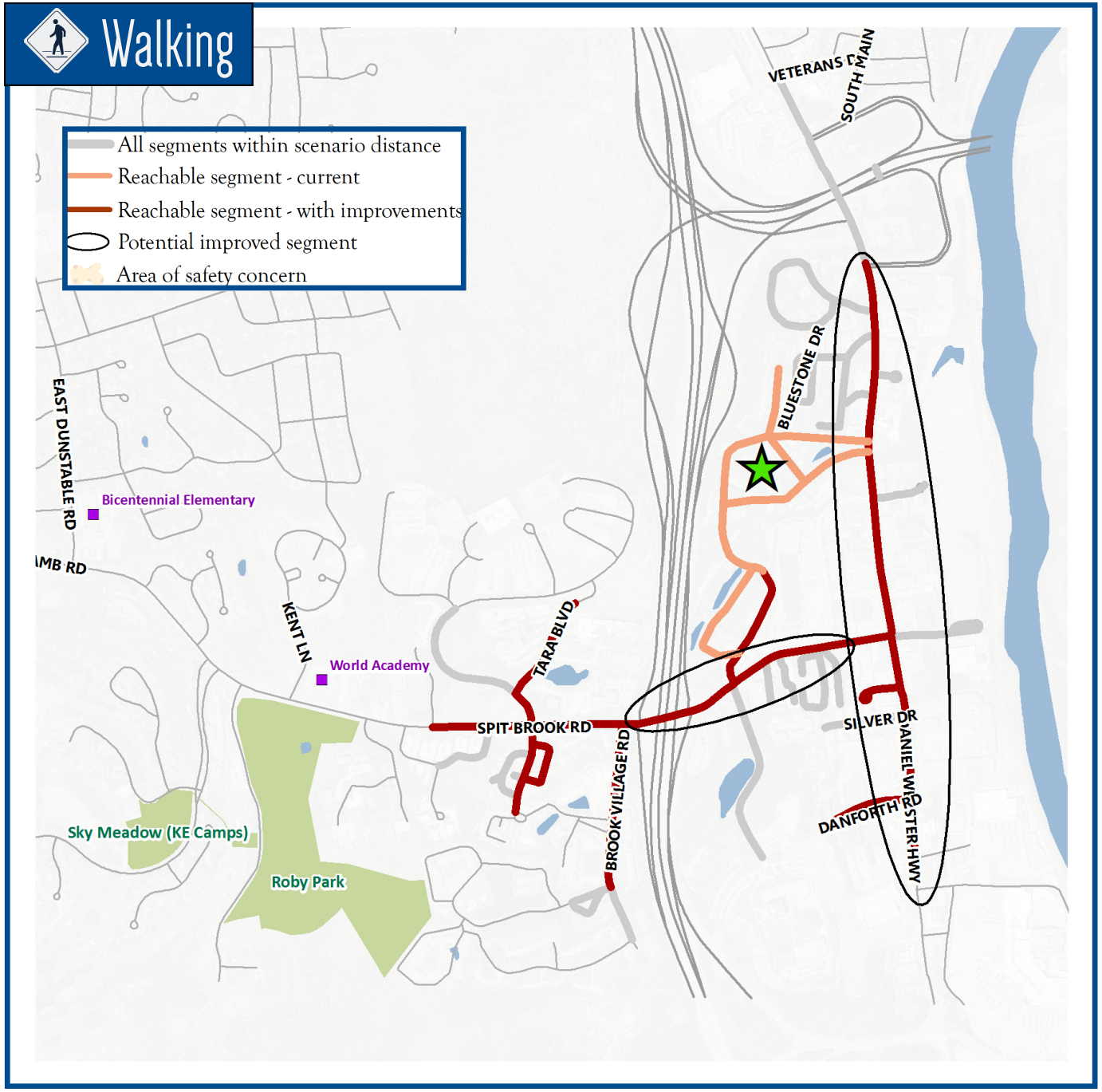
Accessibility within one mile

In this map, the gray lines represent the areas of the City accessible within one mile for a resident of Royal Crest Estates in South Nashua, regardless of the Level of Walkability (LoW). The orange lines represent where that person could go without using a street segment with a LoW greater than 1.

The maroon lines represent new areas open to that same person provided that the following streets or segments were improved using Complete Streets techniques or other improvements:

- Daniel Webster Highway (from Sagamore Bridge to the Massachusetts line)
- Spit Brook Road (from DW Highway to Exit 1)

According to LoW data, the over 500 residents of Royal Crest, as well as the many other multi-family complexes along Daniel Webster Highway, are completely cut off from any destinations using only low-stress walking facilities. By improving that corridor and Spit Brook Road, access to recreation and schools is opened up, as well as to the shopping and job opportunities throughout South Nashua.



Royal Crest

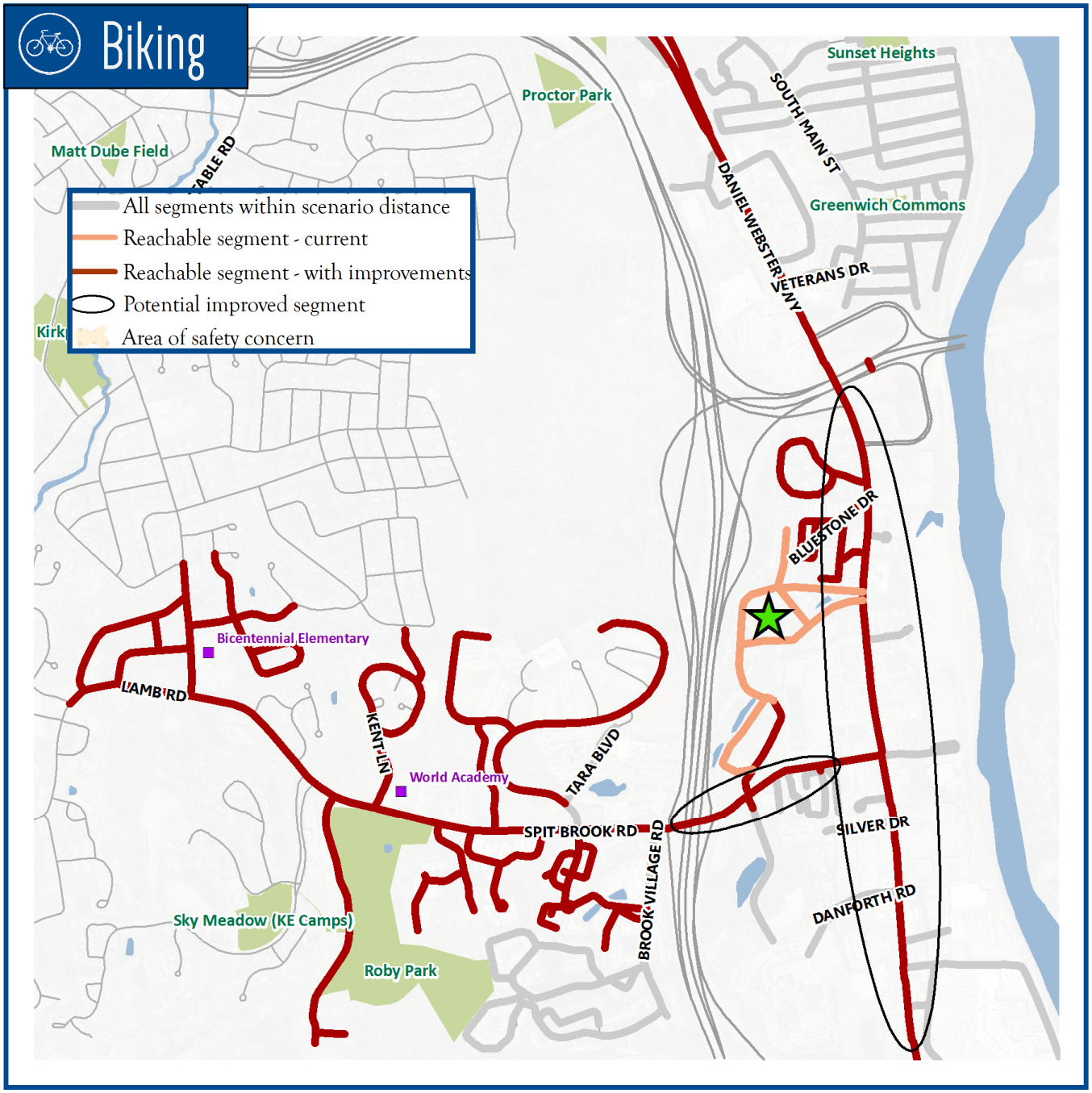
Accessibility within two miles

In this map, the gray lines represent the areas of the City accessible within two miles for a bicyclist from Royal Crest Estates, regardless of the Level of Traffic Stress (LTS). The orange lines represent where that person could go without using a street segment with a LTS greater than 2, an appropriate level of stress for a recreational adult rider

The maroon lines represent new areas open to that same person provided that the following streets or segments were improved using Complete Streets techniques or other improvements:

- Daniel Webster Highway (from Sagamore Bridge to Massachusetts line)
- Spit Brook Rd (from DW Hwy to Exit 1)

According to LoW data, the over 500 residents of Royal Crest, as well as the many other multi-family complexes along Daniel Webster Highway, are completely cut off from any destinations using only low-stress bicycle facilities. By improving that corridor and Spit Brook Rd, access to recreation and schools is opened up, as well as to the shopping and job opportunities throughout South Nashua.



Riverside Street

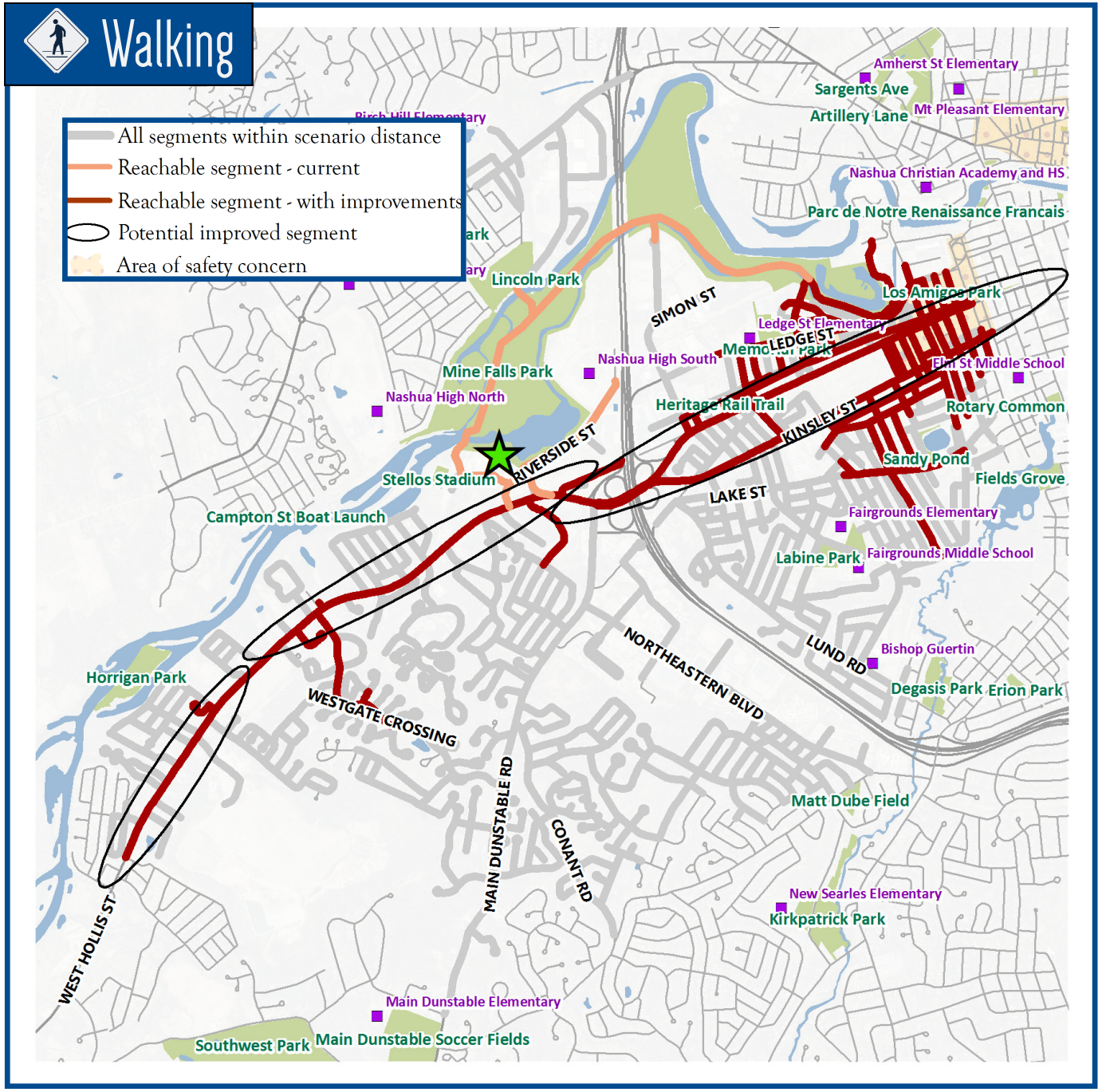
Accessibility within two miles

In this map, the gray lines represent the areas of the City accessible within two miles for anyone walking to Riverside Street, home to the YMCA, Stellos Stadium, and an entrance to Mine Falls Park, regardless of the Level of Walkability (LoW). The orange lines represent where that person could go without using a street segment with a LoW greater than 1.

The maroon lines represent new areas open to that same person provided that the following streets or segments were improved using Complete Streets techniques or other improvements:

- Kinsley Street
- West Hollis Street

Such improvements would lead to greater accessibility for the Tree Streets and several other dense residential neighborhoods. It is important to note that most of the streets still in gray, especially those neighborhoods west of the turnpike, are only shown as inaccessible due to lack of sidewalks. In reality, many of these areas see very little vehicle traffic and are likely less stressful than their scores would indicate.



Riverside Street

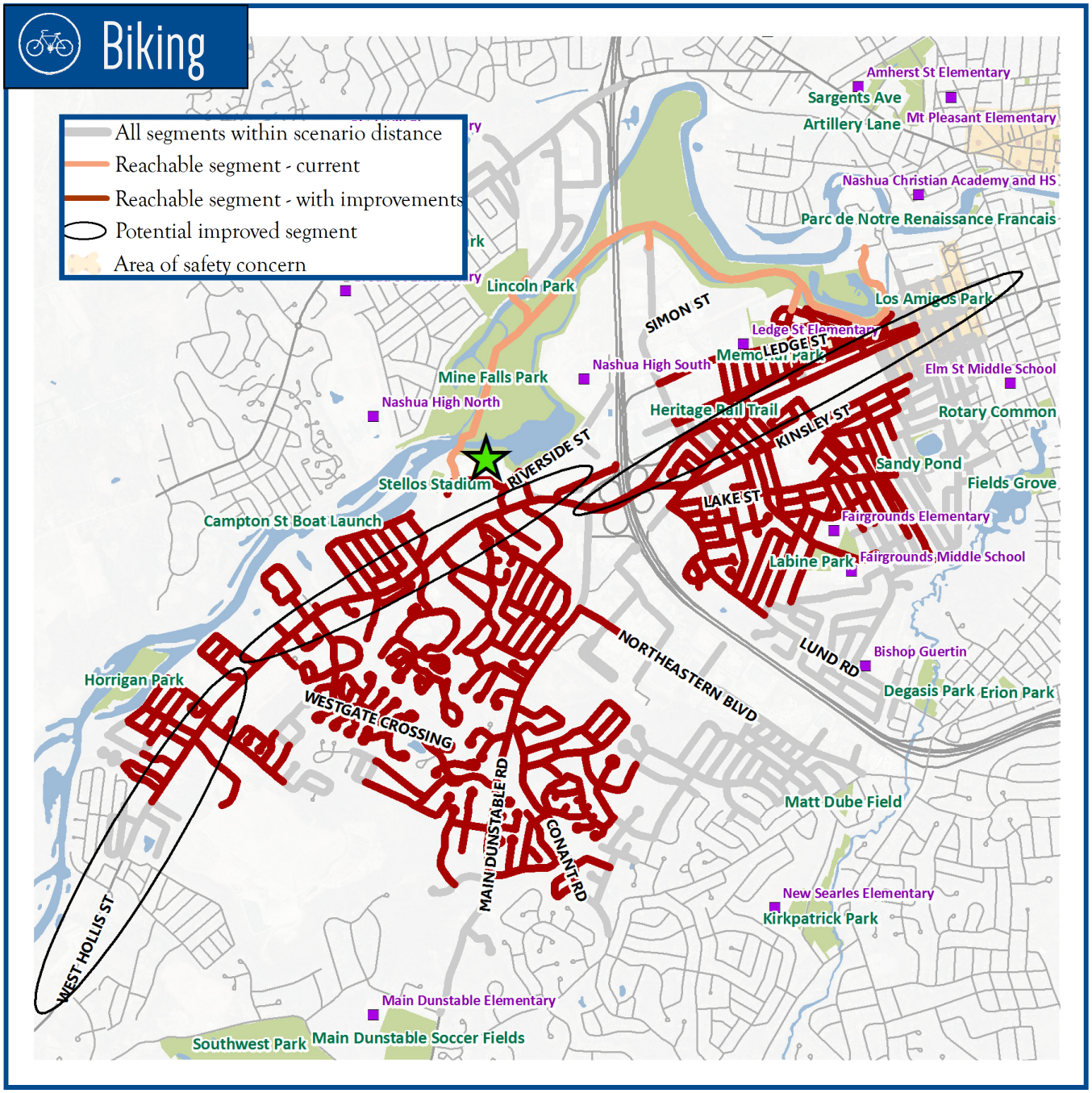
Accessibility within two miles

In this map, the gray lines represent the areas of the City accessible within two miles for a bicyclist to and from the Riverside Street area, regardless of the Level of Traffic Stress (LTS). The orange lines represent where that person could go without using a street segment with a LTS greater than 2, an appropriate level of stress for a recreational adult rider.

The maroon lines represent new areas open to that same person provided that the following streets or segments were improved using Complete Streets techniques or other improvements:

- Kinsley Street
- West Hollis Street

Such improvements would lead to greater accessibility for the Tree Streets and several other dense residential neighborhoods to the east and west of the destination area. Also note that West Hollis Street would connect this area to the rest of Southwest Nashua, where more recreation opportunities exist, including off-road biking trails, playing fields, and the Nashua River Rail Trail.



Amherst Park Apartments

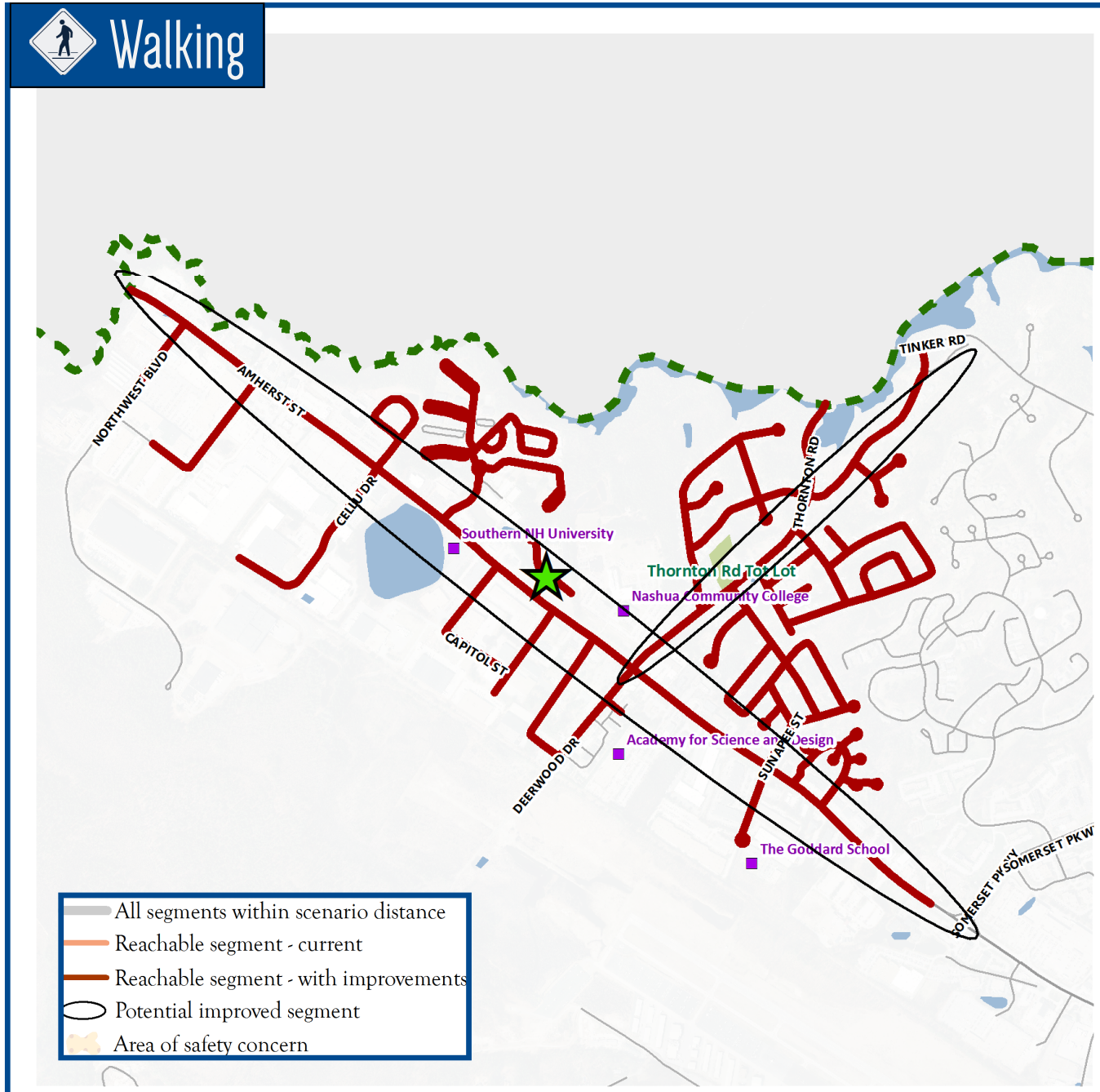
Accessibility within one mile

In this map, the gray lines represent the areas of the City accessible within one mile for a walker originating from the Amherst Park Apartments, regardless of the Level of Walkability (LoW). The orange lines represent where that person could go without using a street segment with a LoW greater than 2. In this example, note the lack of orange lines, indicating no connectivity at that level of stress beyond the apartment complex itself.

The maroon lines represent new areas open to that same person provided that the following streets or segments were improved using Complete Streets techniques or other improvements:

- Amherst Street
- Thornton Road

Such improvements would lead to safe access to all the commercial amenities along the Amherst Street corridor, as well as to jobs and recreational sites in this corner of the City. Several higher education facilities are nearby as well.



Amherst Park Apartments

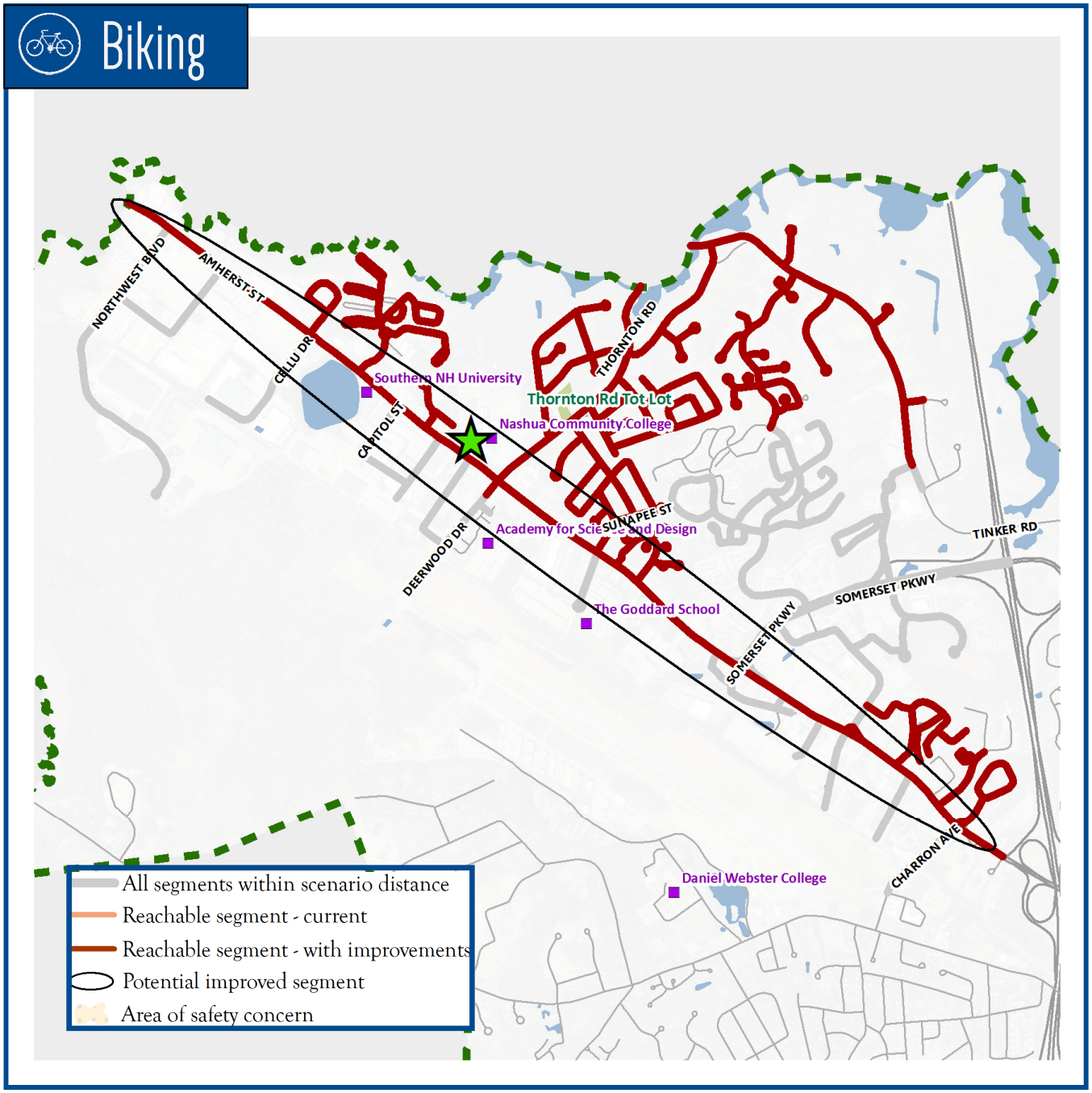
Accessibility within two miles

In this map, the gray lines represent the areas of the City accessible within two miles for a bicyclist originating from the Amherst Park Apartments, regardless of the Level of Traffic Stress (LTS). The orange lines represent where that person could go without using a street segment with a LTS greater than 2, an appropriate level of stress for a recreational adult rider. In this example, note the lack of orange lines, indicating no connectivity at that level of stress beyond the apartment complex itself.

The maroon lines represent new areas open to that same person provided that the following streets or segments were improved using Complete Streets techniques or other improvements:

- Amherst Street

Such improvements would lead to safe access to all the commercial amenities along the Amherst Street corridor. Several higher education facilities are nearby as well. As a major arterial in and out of the city, this would also benefit riders looking for longer connections for commuting and recreational purposes.



"The human race is challenged more than ever to demonstrate our mastery -
Not over nature, but of ourselves."
Rachel Carson, 1960

temporary installations

The goal of a Complete Streets demonstration (pop-up) event is to give a community the chance to experience first-hand how space within the public right-of-way can be reallocated to accommodate various modes of transportation, promote safety, and enhance a sense of place. Complete Street demonstrations are on-street events that temporarily convert a street into an example of a proposed street redesign prior to the engineering and construction phase. They are a way to increase public understanding of design alternatives and to gather feedback from a broad base of neighborhood stakeholders.

A great example of a pop-up event right here in New Hampshire took place on Marlboro Street in Keene. Volunteers installed temporary crosswalks, temporary protected bike lanes, temporary curb extensions, a pedestrian island and a "parklet" (a pop-up mini park in an on-street parking space), to help spark conversations around how better streets contribute to a vibrant community. The temporary design elements were included in a proposed street redesign plan that was prepared in advance of the pop-up event.

A Complete Streets demonstration in Keene, NH in 2015 helped transform a section of Marlboro Street in Keene to a more walkable and more bicycle friendly environment. Photos by Southwest Region Planning Commission.

In addition to streetscape improvements, there were several activities and food trucks to help draw people in and create an enjoyable experience for those who attended the event.

The event brought the community together in a positive atmosphere and showed how the proposed Complete Streets design elements could improve traffic flow while at the same time accommodating bikers, walkers and transit riders..

recommendations

some initial ideas to continue the conversation

Other good ideas can be found in the Pedestrian and Bicycle Plan for the Nashua Region, available at **www.nashuarpc.org**.

1.) Involve residents, business owners and elected officials

Once an improvement has been identified it provides an opportunity to educate and engage residents and business owners about the potential benefits of the improvement. This could occur at an existing neighborhood meeting or event, or at a special event. Elected officials should also be involved in the process to invite contacts and promote participation.

2.) Temporary Installments

After initial education and outreach efforts are made, temporary installations are a great way to build momentum and engage residents and officials to visualize how Complete Streets can enhance their neighborhoods..

3.) Update Road and Sidewalk Standards

Nashua's roadway and sidewalk standards, as noted in the audit, are outdated and would benefit from an update to reflect current practices..

4.) Partner with City Arts Nashua and Great American Downtown

Collaboration is vital to Complete Streets implementation. The City should take advantage of the outstanding organizations already in place and partner with them to promote Complete Streets.

4.) Complete Streets Design Standards

Other communities which have successfully implemented Complete Streets programs have also developed design guideline manuals addressing both desired design and dimensional standards. Such a document would ensure that both staff and developers have the same understanding regarding expectations for the development of Complete Streets.

5.) Complete Streets Task Force

Convene a city taskforce to oversee Complete Streets implementation and policy guidance.

6.) Complete Streets Policy

If enough political support is garnered for Complete Streets the City may consider the adoption of a Complete Streets Policy ensuring that future streets are designed and constructed to meet the needs of bicyclists, pedestrians and motorists. If possible, this policy should be incorporated into the Land Use Code to assure adoption and enforcement.

recommendations, continued

prioritize and implement Land Use Audit recommendations

The land use audit completed as part of the Nashua Plan4Health project offers a great starting point in assuring city codes and standards support a Complete Streets framework. Below are some of the major recommendations to emerge from the audit, however a complete read of the document would provide a more thorough understanding of its analysis and recommendations.

Safety

Implement traffic calming measures, particularly in densely populated areas of the city, and adopt long-term plans for infrastructure maintenance to ensure that new projects are fiscally sustainable.

Transportation

Consider the development of a citywide pedestrian and bicycle master plan and incorporate recommendations into other short- and long-term planning documents. Update the city's roadway and sidewalk design standards.

Land Use

Nashua has identified the development of additional downtown housing as a key long-term goal. In order to minimize parking pressures, the city should consider allowing more on-street parking in designated areas.

Consolidate neighborhood level master plans into a single updated Central/Downtown Nashua Master Plan with realistic benchmarks for implementing goals. Incorporate maintenance considerations into updates of master plans. Consider developing master plans for neighborhoods that are disconnected from Downtown Nashua including South Nashua and the Route 101A corridor.

Design

With maintenance funds stretched thin and the city home to a large number of existing parks and playgrounds, accessibility improvements to parks are a better long-term improvement than the simple expansion of parks. The city's efforts to improve accessibility to Mine Falls Park from the Tree Streets neighborhood is an excellent example of this strategy already in action. However, there are several opportunities to improve park accessibility, including more clearly delineated access points between Downtown Nashua and Mine Falls Park.

The completion of a citywide Complete Streets Design Manual would ensure consistency in adoption and implementation, both from the city and the private sector.

Site Specific Design

In recent decades, South Nashua and the Route 101A corridor have attracted huge swaths of development. However, much of that growth remains difficult to access for pedestrians and cyclists. The city should consider expanding standards and regulatory language in these areas to promote the goal of a more pedestrian-friendly environment over time.

COMPLETE STREETS IN NASHUA NH

APPENDIX

CITATIONS

Page 13:

Improved health outcomes

- "Smart growth community design and physical activity in children" (2013) by Jarrett et al.
- "Research shows easy-to-walk communities can blunt cognitive decline " (2014) by Lynch (study by A. Watts)

Attract more millennials, empty nesters

- http://t4america.org/wp-content/uploads/2014/04/RF-Millennials-Survey-Topline.pdf

Real estate premiums

- The Value of Walkability http://marketurbanism.com/2013/10/17/the-value-of-walkability/

Fewer crashes

- "Roadway safety in rural and small urbanized areas" (2001) Ossenbruggen et al.
- "Safe streets, livable streets" (2006) E. Dumbaugh

Improved social capital, job growth

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- Rethink Marlboro Street - A Complete Streets Demonstration Event–Saturday, September 19, 2015, Keene, NH

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