

2025 REGIONAL BICYCLE PLAN

Central Massachusetts Metropolitan Planning Organization (CMMPO)

Pedaling Toward a Well-Connected Future



November 2025

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Introduction

Plan Overview

The 2025 Central Massachusetts Metropolitan Planning Organization (CMMPO) Regional Bicycle Plan is an essential step toward a future where bicycling is recognized and celebrated as a critical component of a well-balanced, multimodal transportation network. The vision of the Regional Bicycle Plan is closely aligned with the vision of 2050 Connections, the CMMPO Long-Range Transportation Plan (LRTP). The 2050 Connections vision is as follows:

The CMMPO envisions Central Massachusetts in 2050 as a growing region of 40 well-connected, livable communities with congestion reduction, better multi-modal mobility, and improved air quality. Healthy, creative transportation methods that integrate active travel modes using technology will safely and efficiently move people between homes, jobs, and services, and move goods between places of manufacturing and retail distribution.

The vision of the Regional Bicycle Plan is narrower in scope:

Bicycling in Central Massachusetts will be a safe, comfortable, and convenient option for everyday travel.

A commitment to improving bicycle infrastructure is a commitment to multi-modal mobility, congestion reduction, improved air quality, and the health and well-being of the people who live, work, and recreate in the CMMPO region. Achieving the goals of the Regional Bicycle Plan will help the CMMPO region achieve the vision of 2050 Connections. The goals of the Regional Bicycle Plan are:

- 1) To continue the development of a safe regional bicycle network that encourages mode shift
- 2) To identify a prioritized list of potential improvements
- 3) To support local communities in the implementation of bicycle projects while addressing current connectivity gaps in the regional network

Through achieving these goals, communities in the CMMPO region will have access to a list of potential, actionable projects that seek to improve regional connectivity while aligning with local priorities. Furthermore, the CMMPO will collaborate with communities to facilitate the implementation of these projects. There are numerous funding sources available for communities that wish to pursue projects related to bicycle infrastructure.

Definition of Key Terms

This chapter provides definitions and descriptions of key terminology pertaining to bicycle infrastructure. Maintaining consistency with respect to design and technical information is crucial to ensuring a comprehensible and predictable transportation system for all users, increasing safety and efficiency throughout the CMMPO region. Guidelines for definitions and terminology are drawn from numerous sources, including but not limited to the American Association of State Highway and Transportation Officials (AASHTO) [Guide for Development of Bicycle Facilities](#) (2024), the National Association of City Transportation Officials (NACTO) [Urban Bikeway Design Guide](#) (2025), the U.S. Department of Transportation’s [Manual on Uniform Traffic Control Devices](#) (MUTCD, 2024), and the MassDOT’s [Separated Bike Lane Planning & Design Guide](#) (2015).

Bicycle Facility

A bicycle facility, or bikeway, is any road, street, path, or other way which in some manner is specifically designated for bicycle travel. This is a broad term that encompasses many types of bicycle infrastructure; a bikeway does not need to be designed exclusively for bicycle travel—on-street bicycle infrastructure is included in this term. According to a MassDOT engineering directive on the design criteria for MassDOT projects¹, bicycle accommodation shall be in accordance with the *AASHTO Guide for the Development of Bicycle Facilities*.

Micromobility

Micromobility refers to transportation using lightweight vehicles or devices such as bicycles or scooters, especially electric or electric-assisted devices. As new mobility devices become available and more widespread, new challenges are presented with respect to the infrastructure to use such devices. Oftentimes, micromobility devices are provided through shared systems, such as a bikeshare, that cover the “first and last mile” of a trip. Benefits of micromobility devices include reduced traffic congestion, lower emissions, improved public health, and greater accessibility to transit and the greater transportation network.

¹ MassDOT Engineering Directive E-14-006. December 19, 2014.

Shared Roadway Facilities

Humans have the right to operate bicycles on all roadways except where prohibited by regulations or state statute. Shared roadways exist all over the CMMPO region in urban, suburban, and rural areas. There are several ways bicycles can be accommodated along with vehicles, whether in existing lanes or along a paved shoulder. While shared roadway facilities may play an important role in a complete bicycle network, they do not provide the same level of comfort and safety as separated or buffered bicycle facilities.

Shared Lanes

Shared lanes are roadways in which travel lanes are intended to be used by both motorists and bicyclists. Typically, these roadways have low traffic volumes and low traffic speeds (20 mph or less). Roadways in this category, such as local streets, can often feel safe and comfortable for bicycling without dedicated accommodation intended exclusively for bicycle travel. Design features can be incorporated into shared lanes to make them more compatible with bicycling, such as right of way design that encourages lower motor vehicle speeds, trimming of vegetation for improved sight lines and distances, bicycle friendly drainage grates, pavements markings, and appropriate signage to alert motorists to the presence of bicycle traffic.

Sharrows

A sharrow is a shared lane marking that indicates to both cyclists and motorists where bicyclists should be located in the roadway. Sharrows can be useful in a right-of-way when there is insufficient room to provide standard bicycle lanes, such as a tool to help bicyclists with safer lane changes on multi-lane streets. However, sharrows often do not provide a sufficient level of comfort and safety for bicyclists; according to NACTO, a shared lane marking is a pavement marking with a variety of uses to support a complete bikeway network—it is not a bicycle facility type and should not be considered a substitute for bike lanes, separated bike lanes, or other separation treatments where these types of facilities are warranted or space permits. As such, NACTO provides guidance regarding desirable shared lane marking applications:

- To indicate a shared lane situation where bicyclists and motorists travel at similar speeds.
- As a reasonable alternative to a designated bike lane in limiting circumstances.
- To strengthen connectivity in a bicycle facility network.

- To clarify bicycle movement and positioning in a confusing or challenging environment.
- Generally, sharrows are not desirable on streets with speed limits above 35 miles per hour.

Paved Shoulders

A paved shoulder can create space for bicyclists to operate in a way that is not directly within vehicular travel lanes. Roadways that are likely to be constructed with paved shoulders typically observe high vehicle speeds and high vehicle volumes. While paved shoulders can offer enhanced comfort levels for both bicyclists and motorists compared to roadways without a paved shoulder, they are not considered travel lanes—paved shoulders may be used for emergency stopping or as a temporary storage space for disabled vehicles. The target bicycle user type for any given type of bicycle facility may change with context. For example, in an urban context, bicycle facilities may be designed for the “interested but concerned” bicycle user type. Conversely, a bicycle facility connecting two towns in a rural context might be designed primarily for the more confident bicycle user type.

According to a MassDOT engineering directive², the minimum paved outside shoulder or designated bicycle lane width below which a design exception is required is 5 feet. This type of bicycle facility is typically found in rural areas. Generally, it is desirable to increase paved shoulder widths along corridors where higher levels of bicycle travel are anticipated, roadway speeds exceed 50 miles per hour, or heavy trucks, buses, or other heavy vehicles often drive. A different MassDOT engineering directive³ provides guidelines for the presence of rumble strips along roadways where bicycle travel is permitted:

“In areas with paved shoulders of 8 feet or more, rumble strips shall be installed in the paved outside shoulder 4 inches from the outside edge line. The rumble strips shall be applied in a gap pattern, with 16-foot gaps between each 64-foot run of rumble strip. These gap openings are intended to permit bicyclists to maneuver in and out of the shoulder to make left turns and to avoid debris or obstacles in the shoulder. If the paved outside shoulder is less than 8 feet, rumble strips shall not be installed.”

² MassDOT Engineering Directive E-14-006. December 19, 2014.

³ MassDOT Engineering Directive E-14-004. July 21, 2014.

Bicycle Lanes

Bicycle lanes (or bike lanes) are designated travel lanes for bicyclists. While there are many different types of bicycle lanes, it is typical for a bicycle lane to be designated by striping and a symbol of a bicyclist along with signage alerting all transportation network users of the presence of the bicycle facility. Bike lanes are often installed as one-way travel lanes that move in the same direction as the adjacent vehicle or parking lane. Bike lanes provide space for bicyclists to travel at predictable speeds in a predictable manner. Bike lanes are generally regarded as the preferred facility for thoroughfares in both urban and suburban areas. In some instances, bike lanes may be desirable in rural areas, especially in the vicinity of denser areas, village centers, or historical settlements.

When considering bike lane type and configuration, a thorough analysis of existing traffic conditions is necessary, including an examination of safety measures to protect bicyclists from moving or parked vehicles.

Types of Bicycle Lanes:

Conventional Bike Lane: A conventional bike lane is a travel lane dedicated exclusively to bicyclists. Bike lanes are located adjacent to motor vehicle travel lanes and flow in the same direction as motor vehicle traffic. Conventional bike lanes are typically located on the right side of the street between the adjacent motor vehicle travel lane and the curb, road edge, or parking lane. In the case of a one-way street, conventional bike lanes may be located on the left side of the motor vehicle travel lane. The image below shows a conventional bike lane on Green Street in Worcester, Massachusetts.



(Source: Central Massachusetts Regional Planning Commission (CMRPC))

Separated/Buffered Bike Lane: A separated or buffered bike lane is a conventional bike lane with a specifically designated space separating the bike lane from the motor vehicle travel lane and/or parking lane. Typically, pavement markings are utilized to designate the space between the bike lane and the motor vehicle travel lane. Bollards or stanchions may be used in the designated space to provide an additional buffer between the bike lane and the motor vehicle travel lane.

Parking Protected Bicycle Lane: A parking protected bike lane is a bicycle travel lane that is separated from the motor vehicle travel lane(s) by a parking lane. Typically, a pavement marking buffer is designated between the parking lane and the bike lane; however, this buffer may also include bollards, stanchions, a curb, or planters to create a more prominent separation. Parking protected bike lanes reduce the risk of a bicyclist or a user of a micro-mobility device being struck by a motor vehicle or by a vehicle passenger

opening a door. The image below shows a parking-protected bicycle lane on Mill Street in Worcester, Massachusetts.



(Source: City of Worcester, Department of Transportation & Mobility (DTM) <https://www.worcesterma.gov/mobility/projects-engineering/mill-street>, accessed September 2025)

Left-Side Bike Lane: A conventional bike lane placed on the left side of a one-way street can offer some advantages, especially on roadways with heavy transit or delivery traffic that may be stopping frequently on the right side of the roadway. Another potential advantage of left-side bike lanes is reduced frequency of “dooring,” where a motor vehicle passenger opens their door and a bicyclist collides with the open door.

Cycle Tracks

Cycle tracks can take many forms; in essence, a cycle track is a physically separated bicycle facility that provides a greater level of comfort and safety than conventional bike lanes or even separated/buffered bicycle lanes. Common elements of a cycle track include space designated exclusively for bicycle traffic and separation from motor vehicle travel lanes, parking lanes, and sidewalks. According to the [NACTO Urban Bikeway Design Guide](#), a cycle track can be at street level or sidewalk level; in the case of a sidewalk level cycle track, a curb or median separates the cycle track from the motor vehicle travel or parking lane, while texture, material, or color distinguishes the cycle track from the sidewalk. In the

case of street level cycle tracks, there must be some form of buffer, such as a raised median, curb, or barrier.

Bicycle Boulevards

A bicycle boulevard is a street designed primarily for bicycle traffic. This type of bicycle facility provides continuous, comfortable bike routes through the local street network. As such, bicycle boulevards are characterized by slow motor vehicle speed and low motor vehicle volumes. Specifically, total vehicle volume should be below 3,000 per day, and the 95th percentile speed is at or below 25 mph. Where such values are higher, design attention is needed to reduce speeds, divert motor vehicle traffic, and prioritize bikes at intersections and crossings. This type of facility is compatible with a wide variety of land use contexts, densities, and curbside uses. Bicycle boulevards should allow bicycle travel in both directions, regardless of whether the street allows one-way or two-way motor vehicle operations. The image below shows a design concept for a bicycle boulevard.



(Source: National Association for City Transportation Officials (NACTO))

<https://nacto.org/publication/urban-bikeway-design-guide/designing-bikeways-for-all-ages-and-abilities/bikeways-on-low-speed-low-volume-streets/bike-boulevards/>, accessed September 2025)

Shared-Use Facilities

Shared-use facilities are a type of infrastructure designed to be separated from vehicular traffic. The most common shared-use facility is typically referred to as a shared-use path. Shared-use paths are pathways for bicyclists, pedestrians, and users of various micro-mobility devices. Oftentimes, shared-use paths provide scenic connections across larger geographies, following rivers or other waterways, abandoned or active rail lines, utility corridors, or limited access roadways. Shared-use paths are intended to be used by a wide variety of people and a wide variety of skill levels. Usually, shared-use paths accommodate travel in both directions, warranting a width of at least 10-14 feet. Shared-use facilities provide an important piece of a safe, comfortable, and convenient bicycle network; however, they are not a substitute for on-road infrastructure. A well-built network offers options for all roadway users. Careful consideration ought to be given to connections to the street network. Access points are essential for users to reach destinations, but too many access points can create too many potential conflict points with on-road traffic. At these potential conflict points, it is important to incorporate signage, markings, and/or design elements to discourage or prevent unauthorized motorized access while also providing safety measures for authorized users to continue through the potential conflict point safely. In areas with particularly high volumes of users, designers may want to consider segregating bicyclists from pedestrians to reduce potential conflicts. The image below shows a segment of the Blackstone River Bikeway shared-use path that connects Worcester to Millbury.



(Source: Central Massachusetts Regional Planning Commission (CMRPC))

End-of-Trip Facilities

End-of-trip facilities can provide additional incentives for commuters and recreational bicyclists to travel by bicycle. Effective bicycle parking, lockers, bathrooms, water fountains, and showers are all facilities that enhance the experience of bicyclists by making it as easy, safe, and convenient as possible. These facilities might be the difference maker for some people when choosing to travel by bicycle versus other means of transportation. End-of-trip facilities include convenient connections to other modes of transportation, such as the capability of a transit bus to accommodate bicycles.

Bicycle User Types

When people bicycle on roadways, they encounter varying levels of stress from traffic. For example, a quiet residential street with a 25-mile-per-hour speed limit is considered a low stress environment for bicyclists. Conversely, a six-lane suburban highway with a 40-mile-per-hour speed limit is considered a high-stress environment for bicyclists. Different types of people who bicycle may have different comfort levels, or stress tolerances, while biking. Roger Geller at the City of Portland developed typologies for four types of bicyclists. The four bicycle user types are as follows:

- 1) **No Way, No How:** This group includes people unwilling to ride a bicycle even if high-quality bicycle infrastructure is in place.
- 2) **Interested but Concerned:** This group includes people willing to bicycle if high-quality bicycle infrastructure is in place. This group of people has a relatively low tolerance for stress while bicycling.
- 3) **Enthusied and Confident:** This group includes people willing to bicycle if some bicycle-specific infrastructure is in place. This group of people has a medium tolerance for stress while bicycling.
- 4) **Strong and Fearless:** This group includes people willing to bicycle with limited or no bicycle infrastructure in place. This group of people has a high tolerance for stress while bicycling.

Jennifer Dill, Ph.D., at Portland State University, led a survey of adults in the 50 largest metropolitan regions in the U.S. to determine how many people fall into each of these categories. Dill found that depending on metropolitan region, roughly 31-37% of people fall into the **No Way, No How** category, 51-60% of people fall into the **Interested but Concerned** category, 5-10% of people fall into the **Enthusied and Confident** category, and

1-7% of people fall into the **Strong and Fearless** category.⁴⁵ In order to build bicycle facilities that promote bicycling as a safe, comfortable, and convenient option for everyday travel for the majority of the population, bicycle facilities should be designed and built for the Interested but Concerned bicycle user type. This logic applies best to urban and suburban contexts, where the potential for everyday biking is understood to be higher than in rural contexts.

⁴ Dill, Jennifer, "Types of Cyclists," Portland State University, January, 2013.

⁵ Dill, Jennifer, "Revisiting the Four Types of Cyclists: Findings from a National Survey," *Transportation Research Board*, January 2016.

Importance and Benefits of Bicycling

Importance of Bicycling

Riding a bicycle is a healthy, efficient, and low-cost way to travel for both transportation and recreation purposes. Residents across the Commonwealth of all ages and riding abilities choose to bicycle for routine trips, such as commuting, shopping, or visiting friends and family. Bikeable communities provide safe, comfortable, and convenient bicycle infrastructure for all different types of users. A bikeable community can be urban, suburban, or rural, as short trip opportunities exist everywhere in the CMMPO region. When a greater number of people choose to ride bicycles, individuals and communities can experience benefits related to mobility, health, safety, economy, environment, and access.

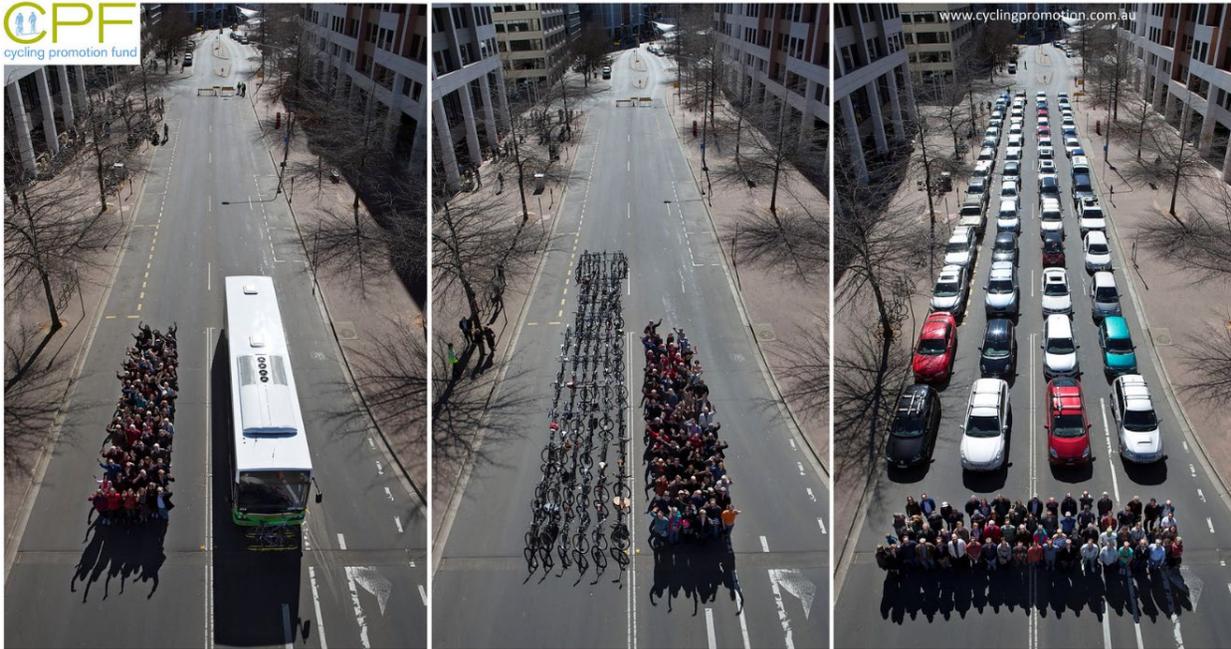
Benefits of Bicycling

Mobility & Congestion

A key part of the first goal of this plan is to encourage mode shift. People in the CMMPO region have become increasingly dependent on personal vehicles for transportation. By building an effective regional bicycle network, our region can provide people with more travel options. Statewide, 57% of all trips (by car, walking, or biking) are under three miles, but only 1.2% of trips between 0 and 3 miles are made by bicycle.⁶ According to the previous CMMPO Bicycle Plan's survey results, 65% of respondents indicated they would be willing to ride a bicycle five or more miles to a destination. The top reason these respondents didn't walk or bike more often was primarily safety concerns. Creating a safe, comfortable, and convenient bicycle network would likely convert a significant number of everyday trips from car trips to bike trips, playing a significant role in congestion reduction.

The amount of road space required for travel changes drastically based on the mode of transportation. The following image is a recreation of a classic image demonstrating how much road space is needed to transport 60 people by bus, bike, or car. By encouraging mode shift and reducing the amount of roadway space needed to get around, mobility and congestion issues can be significantly alleviated.

⁶ MassDOT Bicycle and Pedestrian Update 2021. [Bicycle and Pedestrian Update - 2021](#)



(Source: [Road space: bus vs bikes vs cars – a famous photo recreated in Canberra – Daniel Bowen](#), accessed February 2025)

Health & Wellness

There is no doubt that riding a bicycle is good exercise for the cardiovascular system. A study published in the *British Medical Journal* in April 2017 found that those who rode a bicycle to work had a 52% lower risk of dying from heart disease and a 40% lower risk of dying from cancer.⁷ While biking provides immediate and direct physical benefits, a recent study has found that increased automobile dependency reduces life satisfaction.⁸ Investing in multimodal planning and nuanced land use patterns may help to reduce automobile dependency and its negative effects on well-being. Using a bicycle to commute to work or school can reduce the risk of many negative health outcomes, including diabetes, cancer, heart disease, hypertension, osteoporosis, depression, and back pain. Additionally, regularly riding a bike can help improve a person's immune system and respiratory function. Biking can be incorporated into everyday life outside of commuting to work or school—short trips like shopping or visiting friends and family are opportunities to ride a bicycle.

⁷ Torjesen, Ingrid. "Cycling to Work has Substantial Health Benefits, Study Finds," April 2017.

⁸ Saadaoui et al., "Does Car Dependence Make People Unsatisfied With Life? Evidence From a U.S. National Survey," *Travel Behaviour and Society*. April 2025.

Safety

Creating roads that are safer and more comfortable for bicyclists can have a beneficial effect on all users of the transportation system. Roadways with separated bike lanes are significantly safer for bicyclists, pedestrians, and motorists compared to streets without separated bike lanes, and are effective in reducing severe injuries.^{9 10} Further, municipalities with higher bicycling rates observe a lower risk of fatal crashes for all roadway users.¹¹ This can be understood as a “safety in numbers” effect; when more people regularly ride their bicycles, fatality rates per trip and per mile traveled decrease.¹² Higher bicycle rates are often associated with a culture of slower and more conscientious driving, resulting in both increased safety and calmer traffic. Beyond a demonstrated increase in safety for all users, it has been shown that motorists value the greater certainty that comes when bicyclists have their own dedicated infrastructure.^{13 14 15 16} This increased certainty is in part due to the fact that bicyclist compliance with traffic signals increases with dedicated bicycle infrastructure. Often, bicyclists claim their non-compliance with traffic signals is because they don’t feel safe due to a lack of protective infrastructure.^{17 18} Furthermore, project evaluations and studies, particularly at bike signals, show improved bicyclist compliance following construction.^{19 20}

⁹ Lusk et al., “Risk of Injury for Bicycling on Cycle Tracks versus in the Street,” *Injury Prevention*. February 2011.

¹⁰ Lusk et al., “Bicycle Guidelines and Crash Rates on Cycle Tracks in the United States,” *American Journal of Public Health*. July 2013.

¹¹ Wesley E. Marshall and Norman W. Garrick, “Evidence on Why Bike-Friendly Cities are Safer for All Road Users,” *Environmental Practice* 13, 2011.

¹² Pucher et al., “Making Cycling Irresistible: Lessons from the Netherlands, Denmark, and Germany,” *Transport Reviews*, July 2008

¹³ Sanders, Rebecca Lauren, “Examining the Cycle: How Perceived and Actual Bicycling Risk Influence Cycling Frequency, Roadway Design Preferences, and Support for Cycling Among Bay Area Residents,” *University of California, Berkeley*. 2013.

¹⁴ Monsere, McNeil, and Dill, “Multiuser Perspectives on Separated, On-Street Bicycle Infrastructure,” *Journal of the Transportation Research Board*. 2012.

¹⁵ Goodno et al., “Evaluation of Innovative Bicycle Facilities in Washington, D.C.,” *Journal of the Transportation Research Board*. 2013.

¹⁶ Monsere et al., “Lessons from the Green Lanes: Evaluating Protected Bike Lanes in the U.S.,” 2014.

¹⁷ Chaloux et al., “Rules of the Road: Compliance and Defiance among the Different Types of Cyclists,” 2019.

¹⁸ Johnson et al., “Riding through red lights: The rate, characteristics and risk factors of non-compliant urban commuter cyclists,” 2011.

¹⁹ Monsere et al., “Lessons from the Green Lanes: Evaluating Protected Bike Lanes in the U.S.,” 2014.

²⁰ Bicycle Facilities and Safety. [Facilities Statistics | PeopleForBikes](#)

Economy and Cost Reduction

In a study published by the Transportation Research and Education Center, it was found that bicycle infrastructure had either positive or non-significant impacts on the local economy as measured through sales and employment.²¹ This study examined 14 corridors across six cities. In 2012, bike lanes were installed on Central Avenue in Minneapolis by reducing lane width and removing parking lanes. Retail employment increased by 12.64% on Central Avenue, while increasing only 8.54% in the control study area a few blocks away. Furthermore, Central Avenue saw a 52.44% increase in food sales, while the control area only saw a 22.46% increase in food sales.²² Additional studies by Smart Growth America and the National Complete Streets Coalition have found similar results.

Furthermore, biking is an affordable mode of transportation. In Massachusetts, the average cost per year of owning, operating, and maintaining a motor vehicle is \$8,500, while the average cost per year of owning, operating, and maintaining a bicycle is \$300.²³ Massachusetts households spend an average of 12% of their income on transportation.²⁴ Bicycling is a great way for households to reduce transportation spending by up to 94%.²⁵ Individuals save money when they bike instead of drive; however, these benefits are not exclusive to individuals—numerous studies have shown that support for and investment in bicycle infrastructure leads to economic benefits for businesses and communities as well.²⁶ For example, the cost to society of driving a vehicle is significantly higher than the cost to society of riding a bicycle. A recent study exploring the costs and benefits of driving, cycling, and walking in the European Union attempted to quantify broader impacts to society of each mode. Researchers found that driving a car had an estimated cost to society of 18 cents per mile due to associated pollution, land use, collisions, and infrastructure construction and maintenance costs.²⁷ Opting to drive was associated with a cost to the individual of \$1.60 per mile, due to the cost of operating a vehicle, travel time, congestion, and parking.²⁸ By contrast, cycling generated a benefit to society of 32 cents per mile, primarily due to the health benefits of riding a bicycle. The cost to the individual of opting to ride a bicycle was 26 cents per mile, due to perceived safety and discomfort, risk

²¹ Liu, Jenny, “Understanding Economic and Business Impacts of Street Improvements for Bicycle and Pedestrian Mobility,” National Institute for Transportation and Communities. June 2019.

²² Ibid.

²³ MassDOT Municipal Resource Guide for Bikeability, 2019.

²⁴ Ibid.

²⁵ Ibid.

²⁶ “Evaluating the Economic Impact of Shared Use Paths in North Carolina,” *Institute for Transportation Research and Education*. February 2018.

²⁷ Gössling et al., “The Social Cost of Automobility, Cycling and Walking in the European Union,” *Ecological Economics*. April 2019.

²⁸ Ibid.

of accident, and travel time.²⁹ It follows that investments made into bicycle infrastructure eventually pay for themselves due to reduced health-related costs.

Environmental

According to the Massachusetts Executive Office of Energy and Environmental Affairs (EEA), the transportation sector is the single largest source of greenhouse gas (GHG) emissions in the Commonwealth, accounting for approximately 37% of statewide emissions of GHGs. Massachusetts is approaching pollution reduction with two primary strategies: first, transitioning the vehicles on the roads to electric vehicles (EVs), and second, reducing the number of people that rely on driving by providing them with more transportation alternatives. A key component of the second strategy is providing improved bicycle and pedestrian infrastructure. Indeed, the opportunity to shift automobile trips to biking or walking trips reflects an enormous opportunity to reduce the GHGs released into the atmosphere. People who live in geographic areas that meet Environmental Justice (EJ) criteria experience a disproportionate health-related burden from the transportation network.

Access for All

Investments in bicycle infrastructure advance specific equity-related goals, particularly with respect to low-income households and individuals, minority populations, older adults, and people with disabilities. While people of all income levels ride bicycles, it has been shown that people with lower incomes are more likely to bike for transportation-related purposes.³⁰ Further, it has been demonstrated that riding a bicycle to school is more common among children from low-income and minority households.³¹ Access to safe and comfortable bicycle infrastructure allows for greater independence and reduces reliance on cars for all people, particularly older adults and youth who cannot drive yet or do not have access to a vehicle, and people with disabilities. Technological advancements have provided various adaptations to increase bicycling accessibility for folks with certain

²⁹ Ibid.

³⁰ Pucher et al., “Bicycling renaissance in North America? An update and re-appraisal of cycling trends and policies,” *Transportation Research: Policy and Practice*, July 2011.

³¹ McDonald, N. “Critical Factors for Active Transportation to School Among Low-Income and Minority Students: Evidence from the 2001 National Household Travel Survey,” *American Journal of Preventative Medicine*, 2008.

mobility impairments. Providing well-built bicycle infrastructure can help individuals reduce their reliance on cars or even eliminate their use of motor vehicles altogether, helping to reduce household expenditure.

History & Planning Context

Previous CMMPO Regional Bicycle Plan (2018)

The previous Regional Bicycle Plan, released by the CMMPO in 2018, contained a long list of regional priorities. Priorities were categorized into three categories: regional, major, and minor. Regional priorities reflect opportunities to connect centers of activity across larger geographic areas, while major and minor priorities connect centers of activity across more localized geographies. This plan focused its connectivity analysis on the measure of network completeness, identifying gaps in the regional network and developing priorities from there.

Massachusetts Bicycle Transportation Plan (2019)

Massachusetts Department of Transportation (MassDOT) released its Bicycle Transportation Plan in 2019. This plan identified one priority in the CMMPO region: Route 9 connecting Worcester and Shrewsbury. According to this plan, this bicycle network gap forces bicyclists to travel in vehicular lanes and represents an opportunity to extend existing bicycle facilities on the Kenneth Burns Memorial Bridge. This is an ideal location for improved bicycle infrastructure, as significant commercial activity, adjacent residential neighborhoods, and UMass Chan Medical Center/School are nearby. This location would also improve regional connections, for example, the town of Shrewsbury to Worcester.

In early spring 2025, MassDOT released the Next Generation Pedestrian and Bicycle Vision Map, which contains an infrastructure gap analysis regarding bicycle and pedestrian infrastructure throughout the Commonwealth. Flowing from this analysis, MassDOT produced a set of products, including a map of prioritized bicycle project locations and prioritized pedestrian project locations for the entire Commonwealth. A comprehensive list of project locations was also developed for both pedestrian and bicycle modes.

CMMPO Bicycle Compatibility Index (BCI) (2021)

In 2021, the CMMPO released a Bicycle Compatibility Index (BCI), which graded major roadways in the CMMPO region from A through F based on their suitability for bicycle infrastructure. The formula and model used in the BCI are shown below.

Formula:

$$BCI = 0.996BL - 0.125BLW - 0.152CLW + 0.002CLV + 0.0004OLV + 0.035SPD + 0.506PKG - 0.264AREA + 0.25SLOPE$$

Definitions of Factors:

- BL: Presence of paved shoulder or bicycle lane of at least 5 feet. No = 0, Yes = 1
- BLW: Bicycle lane width in feet
- CLW: Width of lane closest to the right edge/curb in feet
- CLV: Vehicles per hour in a single lane
- OLV: Vehicles per hour in other lanes in the same direction, if applicable
- SPD: Posted speed limit in miles per hour
- PKG: Heavy presence of parking in marked or unmarked areas
- AREA: Type of land use – commercial = 0, non-commercial = 1
- SLOPE: The percent slope of the road segment. Less than 6% = 0, over 6% = 1.

BCI Grading System:

Class A: 0 - 1.51

Class B: 1.52 – 2.31

Class C: 2.32 – 3.41

Class D: 3.42 – 4.41

Class E: 4.42 – 5.30

Class F: 5.31+

The BCI highlights the roadway segments in the region that are most compatible for bicycle infrastructure. Class A and B segments are characterized as those with low traffic volumes and speeds and have a right-of-way that could potentially support vehicle and bicycle travel. These segments may already have bicycle infrastructure. Class F roadway segments are likely to have high traffic volumes and speeds and limited capacity for bicycle accommodations; these segments will likely need extensive intervention to support safe, comfortable, and convenient bicycle facilities. The BCI represents another tool in the toolbox of planners, municipal staff, engineers, and interested members of the public; it is

not intended to be prescriptive. The CMMPO recommends that municipalities utilize the BCI as a reference in conjunction with other planning tools.

Complete Streets Program

The Complete Streets Program is a multi-tiered program that allocates funding to municipalities for projects that provide accommodation for all users of the transportation network. For a municipality to be eligible for Complete Streets funding, that municipality must adopt a Complete Streets policy. Complete Streets policies can vary from municipality to municipality; however, MassDOT uses a consistent rubric to either approve or deny a municipality's policy which will determine their eligibility to move on to the next tier of the program. Once a municipality has an approved Complete Streets policy, then they can move on to drafting a prioritization plan, identifying specific projects which may eventually be selected to receive funding. Drafting an ambitious Complete Streets policy can help institutionalize the requirement that new transportation projects include bicycle and pedestrian infrastructure or any other type of accommodation.

Public Participation

Introduction

The CMMPO Bicycle Plan aims to enhance the bicycling landscape in Central Massachusetts. To best serve the people of Central Massachusetts, it is essential to engage community members early in the plan's development. One of the first steps in the creation of this plan was to develop a robust Public Participation Plan designed to engage a wide range of stakeholders, including municipal staff, community members, and local organizations, through proactive outreach and education.

The participation strategy included multiple components: stakeholder engagement, a public survey and interactive mapping tool, incorporation of past survey data, and a series of subregional meetings. These efforts were supported by additional outreach methods, including virtual public involvement, in-person tabling events, and the formation of a Bicycle Plan Advisory Committee. This multifaceted approach ensured broad representation and input from across the region, helping to shape a plan that reflects local needs, priorities, and opportunities for regional connectivity.

Subregional Stakeholder Engagement

A key component of this plan was conducting focused outreach within each of the region's six subregions: Central, North, Northeast, Southeast, Southwest, and West. This structure allowed CMRPC to foster strong communication and collaboration with local town planners and municipal representatives. The goals were to understand subregional priorities as well as localized priorities, identify opportunities for regional and subregional connectivity, and align local planning efforts with broader regional objectives.

The CMMPO initiated contact with each town's Administrator, Town Planner, and Department of Public Works Director, or the most appropriate point of contact when those roles were not present. Subregional meeting times were scheduled, and formal invitations were sent via email. Each meeting included a presentation from CMMPO staff followed by an open discussion, guided by a set of prepared questions to prompt meaningful dialogue.

The subregional meetings helped surface common goals, current and planned projects, and opportunities for collaboration among municipalities. In particular, municipal staff valued the chance to hear about neighboring towns' initiatives, which often inspired cross-

jurisdictional thinking and future partnerships. These subregional stakeholder meetings played a significant role in shaping the CMMPO understanding of local priorities.

Bicycle Plan Advisory Committee

To ensure the Bicycle Plan reflected the needs and priorities of the region's bicycle community, CMMPO staff established a Bicycle Plan Advisory Committee (BPAC). This committee of local stakeholders was selected to represent a diverse cross-section of cyclists and advocates from across Central Massachusetts. The BPAC met on a bi-monthly basis to review the plan's progress, provide feedback on key documents and methodologies, and share updates related to bicycle initiatives within the region. Their input was instrumental in shaping a plan that is grounded in local experience and community insight. In addition to evaluating technical elements of the plan, the committee offered valuable guidance on effective outreach strategies. It helped the CMMPO better understand the challenges and opportunities facing cyclists in the region.

Virtual Public Involvement

To enhance accessibility and broaden community engagement, the CMMPO incorporated a range of virtual tools and platforms into its public outreach strategy. The goal was to engage a wider audience across the region, particularly individuals with limited mobility, scheduling constraints, or other barriers to participation.

Key strategies included the development of a dedicated Bicycle Plan section on the CMRPC website, which provided access to project updates, and a survey to provide comments. This platform served as a centralized hub for members of the public to stay informed and share input at their convenience. The public survey was designed to collect stakeholder input on bicycling conditions across the region, including recommendations for infrastructure improvements, areas of concern, and general feedback on frequently used routes.

To enhance the quality of responses, the survey included an interactive map feature that allowed participants to mark specific routes they use and indicate whether those routes require improvements. This mapping tool provided valuable spatial context to the survey data, helping to identify high-priority areas based on the frequency of submissions and recurring concerns. By visualizing the routes most commonly used or flagged by the public, CMMPO staff was able to better understand where investments in bicycle infrastructure may have the most significant impact and visibility.

In addition, CMRPC leveraged social media channels—Facebook, LinkedIn, Instagram—as well as agency newsletters to promote the Bicycle Plan, share engagement opportunities, and encourage public feedback. These virtual efforts played a critical role in making the planning process more transparent, inclusive, and responsive to community needs.

Public Events

As part of its broader engagement strategy, CMMPO staff participated in various public-facing events to raise awareness about the Regional Bicycle Plan and encourage direct community input. These events provided an opportunity to connect with residents in person, distribute informational materials, and engage in meaningful conversations about local bicycling needs and priorities. CMMPO staff presented at three annual meetings and tabled at four public events throughout the planning process. These events included local community festivals, environmental fairs, regional transportation forums, and walk audits—each offering a platform to reach a diverse cross-section of the population.

At these events, staff shared project updates, distributed flyers, and encouraged attendees to complete the online survey or provide on-the-spot feedback. These in-person interactions were particularly valuable in capturing input from individuals who may not have otherwise participated through virtual channels. Public events also allowed CMMPO staff to observe local biking conditions firsthand, hear unique perspectives from everyday cyclists, and build stronger relationships with community organizations and advocacy groups.

Past Survey Data

To ensure full utilization of recent efforts to engage the public on bicycle-related planning efforts and projects, CMMPO staff reviewed data from several past surveys. These past surveys included a survey that MassBike distributed in 2023, a survey distributed in 2018 as part of the outreach for the previous CMMPO Regional Bicycle Plan, and surveys from the past two updates to the CMMPO Long-Range Transportation Plan (LRTP). Reviewing data from past surveys proved to be crucial in obtaining input from a diverse group of community members throughout the region. The examination of data from a range of surveys ensured a thorough and nuanced understanding of community perspectives, as each survey asked similar questions in different ways.

Local Priorities

Introduction

An essential step in the development of this plan was to develop an understanding of the local priorities throughout the region. CMRPC staff mapped potential projects from Complete Streets Prioritization Plans throughout the region to serve as a starting point for each community's local priorities, as the Prioritization Plans are drafted by municipal staff and subsequently approved by MassDOT.

To further develop our understanding of local priorities, we reached out and engaged municipal staff from each community within the CMMPO region. Outreach included emails to Town Planners, Town Administrators, and DPW Directors/staff from all 40 communities in our region. We scheduled subregional meetings with the following goals in mind:

- 1) Gain input from CMMPO member municipalities on what projects have recently been completed in their respective communities, and how their bicycle priorities have changed in recent years.
- 2) Offer an opportunity for municipal staff to communicate and collaborate with each other on the topic of bicycle infrastructure.

The Central Subregion contains only one community, the City of Worcester. We met with representatives from the City of Worcester Department of Transportation and Mobility (DTM) to discuss their local projects and priorities. CMRPC staff are in continuous communication with Worcester DTM staff, so these procedures flow naturally.

Methodology

We found that a subregional, discussion-based format was particularly beneficial—not only for CMMPO staff to gain information regarding priorities and recent projects, but also for municipal staff to collaborate. The discussion-based format afforded time and space for ideas to emerge, and for municipal staff to learn what was going on in their neighboring communities. To maintain consistency across all subregional meetings, guiding questions remained constant; the only difference was geographical context. We asked the following five guiding questions:

- 1) Have your bicycle/pedestrian priorities changed since 2018?

- 2) What bicycle/pedestrian projects have been completed in your community since 2018?
- 3) How can we best include shared-use paths into the Bicycle and Pedestrian Plans?
- 4) What is an aspirational bicycle/pedestrian project in your community? (think big—the sky is the limit)
- 5) What are we missing? What hasn't been captured in our plan?

During the subregional meetings, we wanted to be open and inclusive of all active transportation projects and priorities. As such, we did not limit our discussion to topics related to bicycling projects—pedestrian priorities and projects were also discussed.

While the CMMPO undertook extensive outreach steps to engage each and every community within our region, there were several communities who failed to communicate with our team. In these cases, CMMPO staff utilized other sources to determine local priorities. These sources included Town Master Plans, Complete Streets Prioritization Plans, Vision Zero Plans, Municipal Vulnerability Preparedness (MVP) plans, and other sources. The comments recorded during the subregional meetings were organized into a table, included in the Technical Appendix.

Statewide Priorities

In 2025, MassDOT released the Next Generation Pedestrian and Bicycle Vision Map, referred to in this document as MassDOT's Next Gen Vision Map. The Next Gen Vision Map is a data-driven map set with the goal of helping make walking and bicycling a more viable option for short trips throughout the Commonwealth. Physical gaps in infrastructure and quality gaps pertaining to existing infrastructure were identified, along with a resulting set of prioritized projects. The MassDOT Next Gen Vision Map serves as a roadmap for “targeted equitable multimodal investments for the foreseeable future [throughout the Commonwealth].”³² Included in the Next Gen Vision Map is a set of lists which specifically identify each project's roadway segments and the prioritization score each segment

³² MassDOT Next Generation Pedestrian and Bicycle Vision Map, 2025.

received. MassDOT's Next Gen Vision Map serves as the most current inventory of state level priorities. Local and state priorities were integrated into this plan through the scoring rubric shown in the Access to Destinations portion of this plan. If a segment was determined to be a local priority, it scored higher in the prioritization process. Further, if a segment was determined to be a state priority, it scored higher in the prioritization process.

The State of Bicycling in Central Massachusetts

According to the Federal Highway Administration’s National Household Travel Survey (NHTS), 52% of all trips made in Massachusetts are three miles or less—a distance typically considered bikeable.³³ Approximately 80% of these short trips are made in vehicles.³⁴ This reflects an enormous opportunity to shift the travel mode for shorter trips from automobile to bicycle. The 2018 CMMPO Bicycle Plan Survey results indicated that 65% of respondents were willing to bike five or more miles to a destination. The top reason respondents didn’t walk or bike more often than they do was safety concerns. While Massachusetts residents make only 1.4%³⁵ of daily trips by bicycle, the communities that have invested in high-comfort bicycle infrastructure and have intentionally fostered a culture of active transportation see among the highest bicycle commute rates in the country.³⁶ While these communities may not be identical to the communities in the CMMPO region, 23% of respondents to the 2023 MassBike Survey indicated they were “interested but concerned” about cycling, while 56% of respondents indicated they were “enthused & confident” bicycle riders. These results indicate that respondents to the 2023 MassBike survey were largely folks who already bike, and may not be representative of the greater population. National polls indicate that 23% is low for the “interested but concerned” bicycle user type; roughly half of the U.S. population is interested in biking more.³⁷³⁸ MassDOT understands that the implementation of high-comfort bikeway networks can be an effective strategy towards realizing the potential of everyday bicycling.

The map below shows the most recent update to the MassDOT Bicycle Facility Inventory data layer, displaying existing and planned bicycle facilities throughout the CMMPO region. This data layer is the authoritative source for bicycle facilities and categorizes bicycle facilities into the following four types: shared-use paths (greenways, rail trails), bike lanes, separated bike lanes, and bicycle/pedestrian priority roadways. As such, this layer includes the off-road bicycle facility network; however, it does not include every trail that allows bicycle travel. The off-road bicycle facility network can play a vital role in a well-connected,

³³ Federal Highway Administration, “National Household Travel Survey,” 2022.

³⁴ Ibid.

³⁵ Ibid.

³⁶ United States Census Bureau, American Community Survey 5-Year Estimates, 2023.

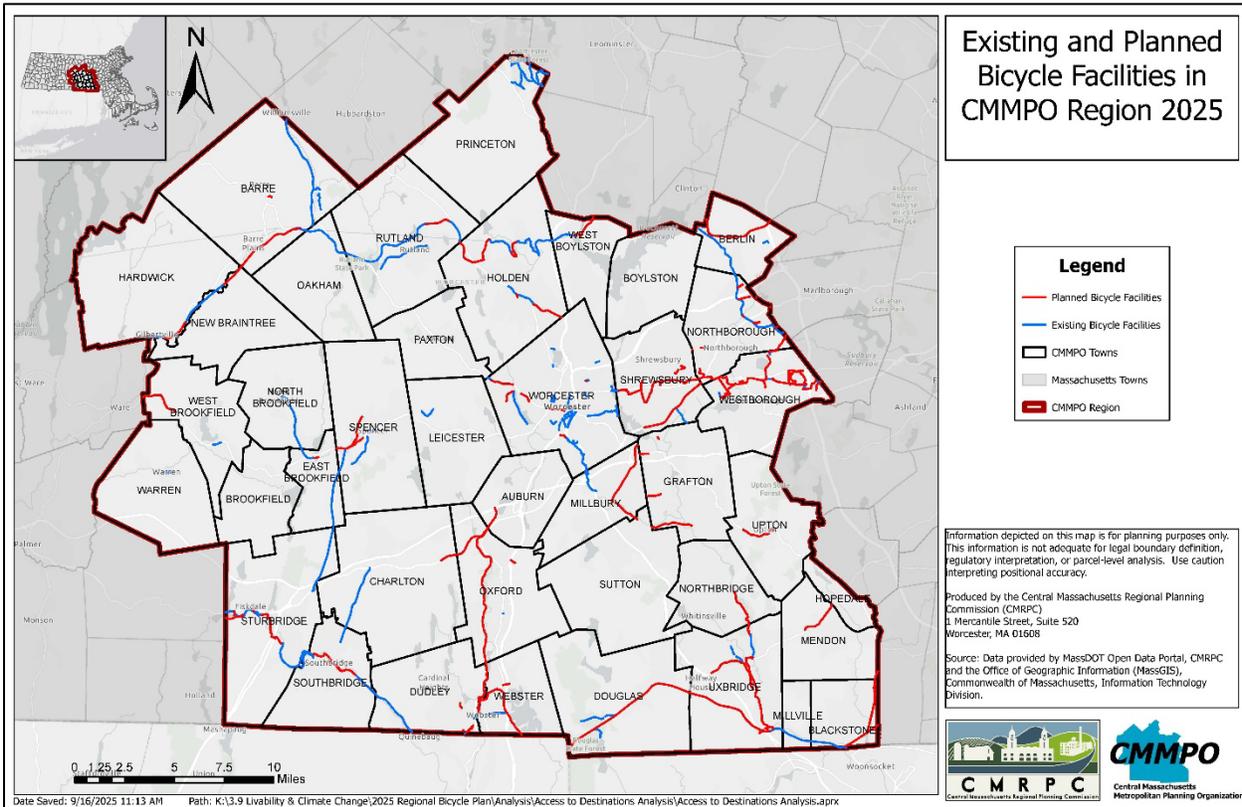
³⁷ Andersen, Michael, “The First National Survey of People ‘Interested But Concerned’ About Biking,” March 2015.

³⁸ Jennifer Dill and Nathan McNeil, “Four Types of Cyclists?: Examination of Typology for Better Understanding of Bicycling Behavior and Potential,” *Journal of the Transportation Research Board*, January 2013.

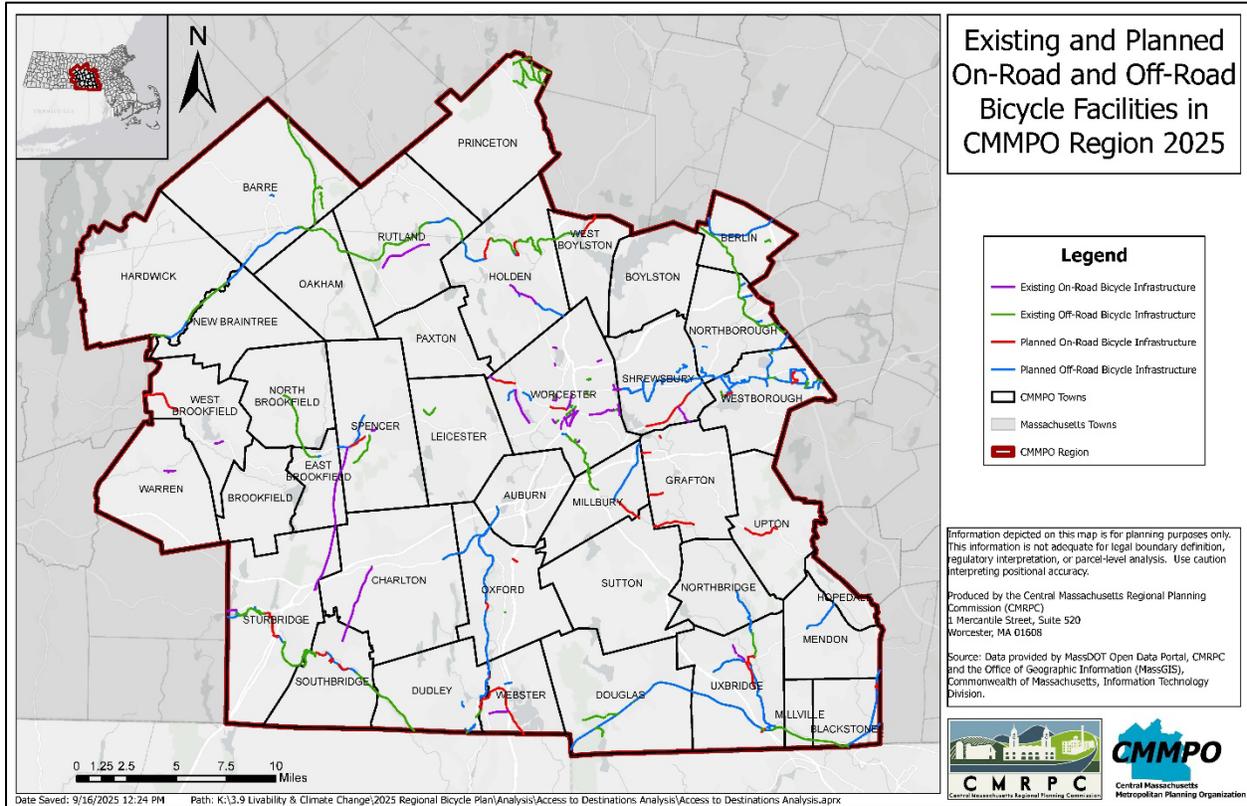
2025 REGIONAL BICYCLE PLAN

convenient, comfortable, and safe regional bicycle network. Shared-use paths can help bicyclists reach their day-to-day destinations while also providing infrastructure for bicyclists to access further destinations that may span across regions or states. The Massachusetts Central Rail Trail (MCRT) and Blackstone River Bikeway are examples of the off-road network providing long-range comfortable bicycling infrastructure. The CMMPO encourages communities to give special consideration to access points along shared-use paths to ensure continuity between the off-road network and the on-road network. While the planned bicycle facilities in the map below do improve connectivity, there is a lot of work to be done to actualize a well-connected regional network.

Existing and Planned Network



Existing and Planned Network Showing On-Road and Off-Road Areas



Connections to Off-road Facilities

There are numerous off-road bicycling opportunities in Central Massachusetts. The off-road bicycle network plays a critical role in providing robust recreational bicycling opportunities throughout the region. The Mass Central Rail Trail (MCRT), Blackstone River Bikeway, and the Southern New England Trunkline Trail (SNETT) represent just a few of the region’s off-road bicycle assets. While the analysis in this plan focuses on access to destinations primarily using the roadway network, shared-use paths play a crucial role in improving access to employment centers, services, shopping centers, and other popular destinations, especially on a regional scale. Further, rail trails and other shared-use paths may constitute a destination for some types of usage. For example, bicyclists who ride for recreation or fitness purposes may drive a motor vehicle to various access points in order to ride on the trail or path. Providing safe and comfortable on-road bicycle infrastructure to rail trails and shared-use paths throughout the region could increase the accessibility and utilization of these assets, as users would be less reliant on motor vehicles to arrive at these destinations.

Connections to Transit (First and Last Mile Connections)

A critical component of a comprehensive bicycle network is the presence and quality of transit connections. Indeed, active transportation modes like walking and bicycling can be combined with public transportation to improve connectivity and increase the reach of these modes. There are several Massachusetts Bay Transportation Authority (MBTA) commuter rail stations in the CMMPO region, all of which have some form of bicycle parking. This offers commuters the option of riding their bikes to the train and then taking the train to a further destination. The Worcester Regional Transit Authority (WRTA) operates a bus system that serves Worcester and numerous surrounding communities. These buses are equipped with bicycle racks on the front which can carry at least two bicycles.

MetroMobility, a Cambridge-based bikeshare company, is partnering with the City of Worcester, Central Massachusetts Regional Planning Commission (CMRPC), and the Worcester Regional Transit Authority (WRTA) to bring an e-bike bikeshare to Worcester. The two-year pilot program is funded by a grant from the Massachusetts Clean Energy Center (CEC). The MetroMobility model focuses on reducing traffic congestion, decreasing harmful emissions, and facilitating accessible and affordable transportation for all. The Worcester pilot program focuses on closing the loop on last-mile connections to and from public transit—one of the two initial e-bike docks will be placed at the WRTA headquarters on Foster Street, also known as the “WRTA Hub.” To increase accessibility to affordable transportation, the MetroMobility model has a low-income price of \$1 per day to use an e-bike. For those who are not income qualified, the cost is \$12 per day.

CMMPO Data Collection: Bicyclist Counts

The CMMPO operates an extensive data collection program, including a traffic counting program, a culvert assessment program, a sidewalk inventory program, a pavement distress surveying program, and a bicycle counting program. The CMMPO manages numerous databases that house the data collected in these programs. Additionally, CMMPO staff regularly upload data to larger, publicly available databases, such as MassDOT’s MS2 database.

The CMMPO bicycle counting program is relatively new and still being optimized for efficiency. Some counts are completed by installing a camera and processing the video by counting bicyclists over a 24-hour period. The CMMPO is in the process of obtaining new

traffic counting machines that can also count bicyclists. These new machines will streamline the bicycle count process and the database management, as the new machines are able to count and classify bicycles automatically.

Bicycle Safety

Vision Zero

The data is clear: roadway fatalities in Massachusetts reached a 14-year high in 2021, increasing year-over-year from 2019.³⁹ Across the Commonwealth and beyond, communities are committing to Vision Zero, a new standard for safety in our transportation networks. The principal goal of Vision Zero is to ensure the basic right of safety for all people as they move about their communities by achieving zero traffic related deaths.

In essence, Vision Zero is a commitment to the belief that death and serious injury on our transportation system is unacceptable and focuses on safe mobility for all users of the network. Vision Zero was first adopted in Sweden in 1997 and has since spread throughout the world. Communities across the United States have developed or are in the process of developing Vision Zero Action Plans. The Federal Highway Administration (FHWA) offers technical resources to assist local communities in reaching their goal of zero traffic related fatalities through the adoption and implementation of Vision Zero. Vision Zero embraces the Safe System approach, which was founded on the principles that humans make mistakes, and human bodies have limited ability to tolerate crash impacts. In a community with a Safe System approach to their transportation network, these human mistakes should never result in death or serious injury. Six principles comprise the foundation of the Safe System approach: roadway deaths and serious injury are unacceptable, humans make mistakes, humans are vulnerable, responsibility is shared, safety is proactive, and redundancy is crucial. The commitment to Vision Zero requires addressing all aspects of safety; the following Safe System elements create a holistic approach that aims to protect all roadway users: safe road users, safe vehicles, safe speeds, safe roads, and post-crash care. A successful Safe System approach is accompanied by a safety culture, wherein safety is the first and most important consideration in transportation system investment decisions. To achieve the vision for zero roadway deaths, everyone must accept that fatalities and serious injuries are unacceptable and preventable.

³⁹ MassDOT, Strategic Highway Safety Plan, 2023.

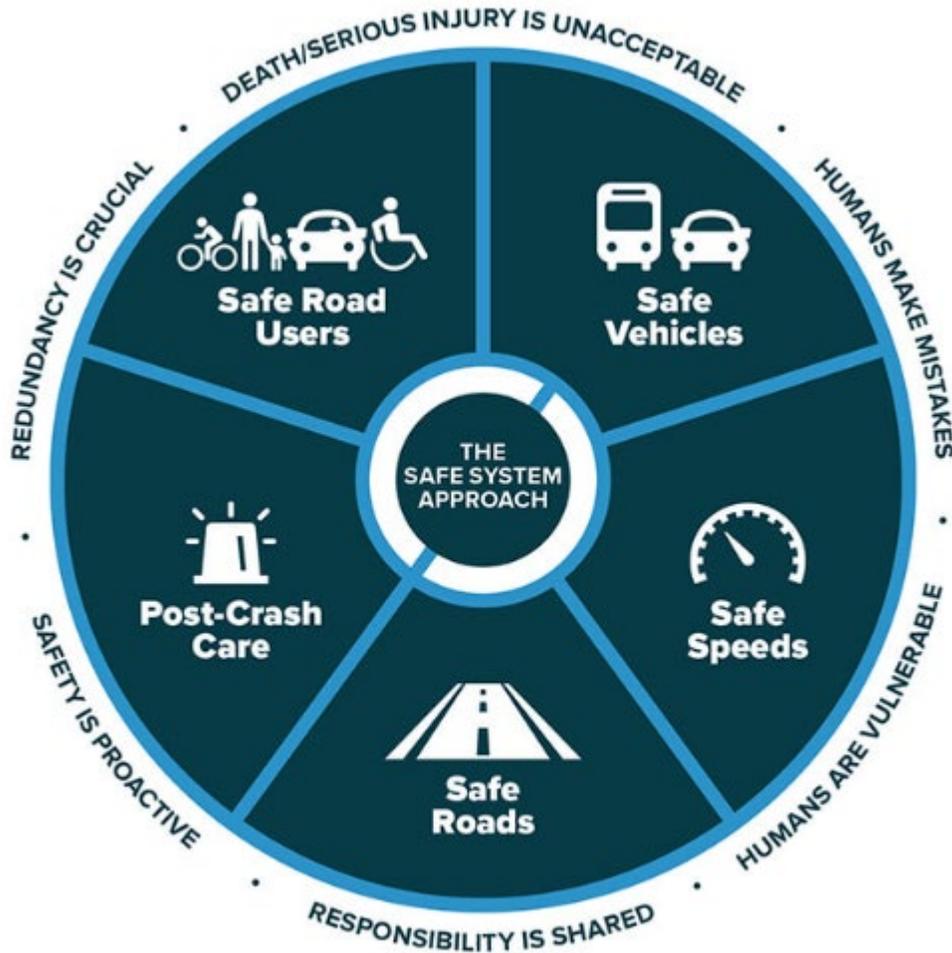
Vision Zero Graphic



(Source: [What is Vision Zero? - Massachusetts Vision Zero Coalition](#), accessed March 2025)

According to MassDOT's 2023 [Strategic Highway Safety Plan](#) (SHSP), Massachusetts has adopted the Safe System approach and prioritizes equity and collaboration in all actionable efforts flowing from the SHSP. The SHSP outlines six initiatives for coordinated implementation: implement speed management to realize safer speeds, address top-risk locations and populations, take an active role to affect change in vehicle design, features, and use, accelerate research and adoption of technology, double down on what works, and implement new approaches to public education and awareness. The SHSP fleshes out these six initiatives in depth.

Safe Systems Approach Graphic



Source: FHWA.

(Source: [Zero Deaths and Safe System | FHWA](#), accessed March 2025)

In addition to promoting the Safe System approach as a path to achieving Vision Zero, the FHWA launched the Proven Safety Countermeasures initiative, which outlines a collection of 28 countermeasures and strategies that have been proven to be effective in reducing roadway fatalities and serious injuries on US roadways. A safety countermeasure is a strategy intended to reduce crash frequency or crash severity on a roadway. Typically, a safety countermeasure involves a physical change to the infrastructure of a roadway segment or intersection; however, there are safety countermeasures that do not include physical changes. The strategies and countermeasures included in FHWA's Proven Safety Countermeasures are designed for all road users and all kinds of roads, including rural and urban roads, high volume freeways and less traveled two-lane State and county roads,

signalized intersections, and much more. Each countermeasure directly addresses at least one safety focus area—speed management, intersections, roadway departures, or pedestrians/bicyclists—while others are crosscutting strategies that address multiple safety focus areas.⁴⁰ Each safety countermeasure has an associated Crash Modification Factor (CMF), which provides a quantitative assessment of the effectiveness of each safety countermeasure. The safety effect of a given safety countermeasure can be a decrease in crashes (CMF below 1.0), increase in crashes (CMF over 1.0), or no change in crashes (CMF of 1.0). Crash Modification Factors can indicate which safety countermeasure will have the greatest impact on decreasing crashes. Safety countermeasures often address specific crash types as well, providing more context for the effectiveness of a given countermeasure in a particular application. The FHWA Proven Safety Countermeasures website contains detailed information pertaining to each of the 28 countermeasures and strategies. While the FHWA has developed CMFs for each safety countermeasure, Massachusetts has also developed State-preferred CMFs. The MassDOT State-preferred CMFs for 8 bicycle related safety countermeasures are included in the Technical Appendix. The FHWA CMF Clearinghouse is a more comprehensive view of all safety countermeasures and associated CMFs.

This plan embraces Vision Zero, the Safe System approach, and encourages the implementation of the FHWA Proven Safety Countermeasures throughout the CMMPO region in a context-sensitive manner.

Regional Safety Performance Measures

Metropolitan Planning Organizations (MPOs) must set targets for safety performance measures and incorporate them into the various certification documents. Required under MAP-21, Section 1203, and continued with the Infrastructure Investment and Jobs Act (IIJA), MPOs must either establish their own set of quantifiable performance targets every year or adopt the State's performance targets. The CMMPO adopts the performance targets from MassDOT. While the overarching goal for MassDOT and the CMMPO is towards zero deaths, the five statewide safety targets for calendar year 2025 are as follows:

- Total fatalities: 365
- Fatality rate per 100 million VMT: 0.58
- Total Serious Injuries: 2,622
- Serious Injury rate per 100 million VMT: 4.17

⁴⁰ Federal Highway Administration, "Proven Safety Countermeasures," accessed June 5, 2025.

- Total Combined Non-Motorist Serious Injuries and Fatalities: 497

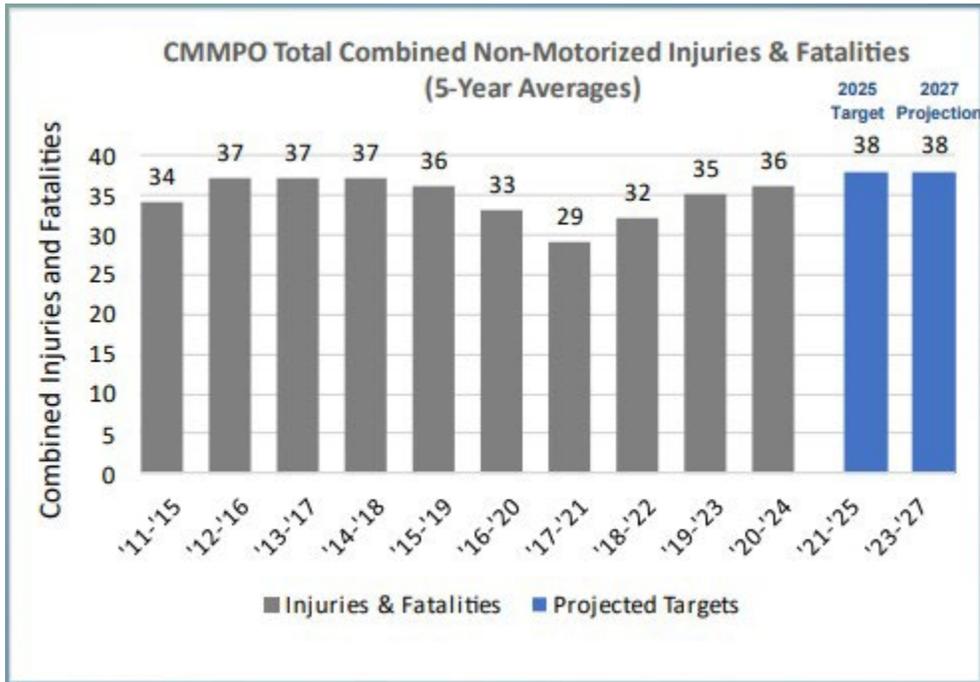
Typically, performance measures are presented in 5-year rolling averages and a trendline is established using historical data. Using historical data and trendline, the CMMPO identifies numbers for the five safety measures that apply to the CMMPO region. The numbers identified below represent 5-year average for calendar years 2021-2025:

- Total fatalities: 38
- Fatality rate per 100 million VMT: 0.67
- Total Serious Injuries: 279
- Serious Injury rate per 100 million VMT: 4.82
- Total Combined Non-Motorist Serious Injuries and Fatalities: 38

The Infrastructure Investment and Jobs Act (IIJA) requires performance targets to demonstrate constant or improved performance. While the ultimate goal for both MassDOT and the CMMPO is to achieve zero fatalities and serious injuries, it is important to understand that this goal cannot be achieved overnight. MassDOT and the CMMPO recognize that short-term, incremental steps must be demonstrated to eventually reach the long-term goal of zero fatalities and serious injuries. As such, the state targets are not goals, rather they are realistic targets considering the events of the past 5-10 years.

The chart below shows CMMPO total combined non-motorized injuries and fatalities as 5-year averages. The target numbers for 2025 and 2027 5-year averages are higher than all previous 5-year averages from the past 10 years. This is due to the post-pandemic trend of steadily increasing numbers of non-motorized injuries and fatalities. As such, these numbers do not represent goals, rather they represent the number of non-motorized injuries and fatalities that are expected to occur. These trends and projections underscore the need for more and improved safety countermeasures to protect vulnerable road users.

Chart: CMMPO Total Combined Non-Motorized Injuries and Fatalities (5-Year Averages)



(Source: Central Massachusetts Regional Planning Commission (CMRPC))

As more transportation agencies develop projects aimed at improving the landscape of active transportation, they are looking for the best methods for planning and prioritizing investments. In a constrained funding environment, it is crucial for transportation agencies to be able to effectively identify the projects and investments that will provide the highest level of benefit. Performance measures allow transportation agencies to align decisions with established community goals. An essential first step to developing high quality performance measures is to fully understand community goals. Compelling and quantitative performance measures are essential for bicycle infrastructure projects, as there is often pushback against bicycle infrastructure. Indeed, the process of proving that investments will be fruitful is critical for the longevity and sustainability of creating a well-connected network of bicycle infrastructure. The FHWA [Guidebook for Developing Pedestrian and Bicycle Performance Measures](#) is a helpful resource for this process and contains detailed explanations on how to track each performance measure and specific measures to use.

Safety Data and Trends

Introduction

The analysis in this plan is comprised of two major focus areas. The first focus area is a comprehensive safety analysis; the second focus area is a connectivity analysis with an emphasis on access to destinations and level of traffic stress (LTS). The safety analysis examines bicycle crash data from the most recent 10-year period of closed crash data to establish a nuanced understanding of the characteristics of bicycle crashes in Central Massachusetts. Both crash-based and risk-based safety analysis were incorporated into the scoring of priorities. Further, through the safety analysis, CMMPO staff identified various trends and patterns that form the basis for how communities in Central Massachusetts can improve the safety of their transportation network.

Methodology

While there are several data sources for bicycle crash locations in Massachusetts, as well as other datasets pertaining to safety, there are a couple of challenges when it comes to examining data with regards to bicycle safety. Since the number of bicycle crashes is relatively low compared with motor vehicle crashes, a longer time frame is needed to observe trends or patterns with respect to bicycle crashes. The typical timeframe for analyzing safety data pertaining to bicyclists is 10 years. When working with crash data, an important determination is whether the data is considered open or closed. Open data means that the data is subject to change due to ongoing investigations. Closed data means that the data is confirmed and not subject to change. For this reason, closed crash data tends to be 2-3 years old. Thus, the chosen 10-year period of crash data analyzed in this plan is the most recent 10-year period of closed crash data, ending in 2021. In an effort to incorporate and understand data and trends from during and after the Covid-19 pandemic, open data from January 1, 2022 to December 31, 2024 was separately analyzed. It is critical to analyze this data with the understanding that it is open, and thus subject to change.

Bicyclist crash data was downloaded from the MassDOT Impact Crash Data Portal in March 2025 for the most recent 10-year period of closed data: 2012-2021. This data was converted to a shapefile to visualize results. Various queries were used to analyze the data and reveal trends over time as well as geospatial trends, contributing to a more nuanced understanding of bicycle safety throughout the CMMPO region.

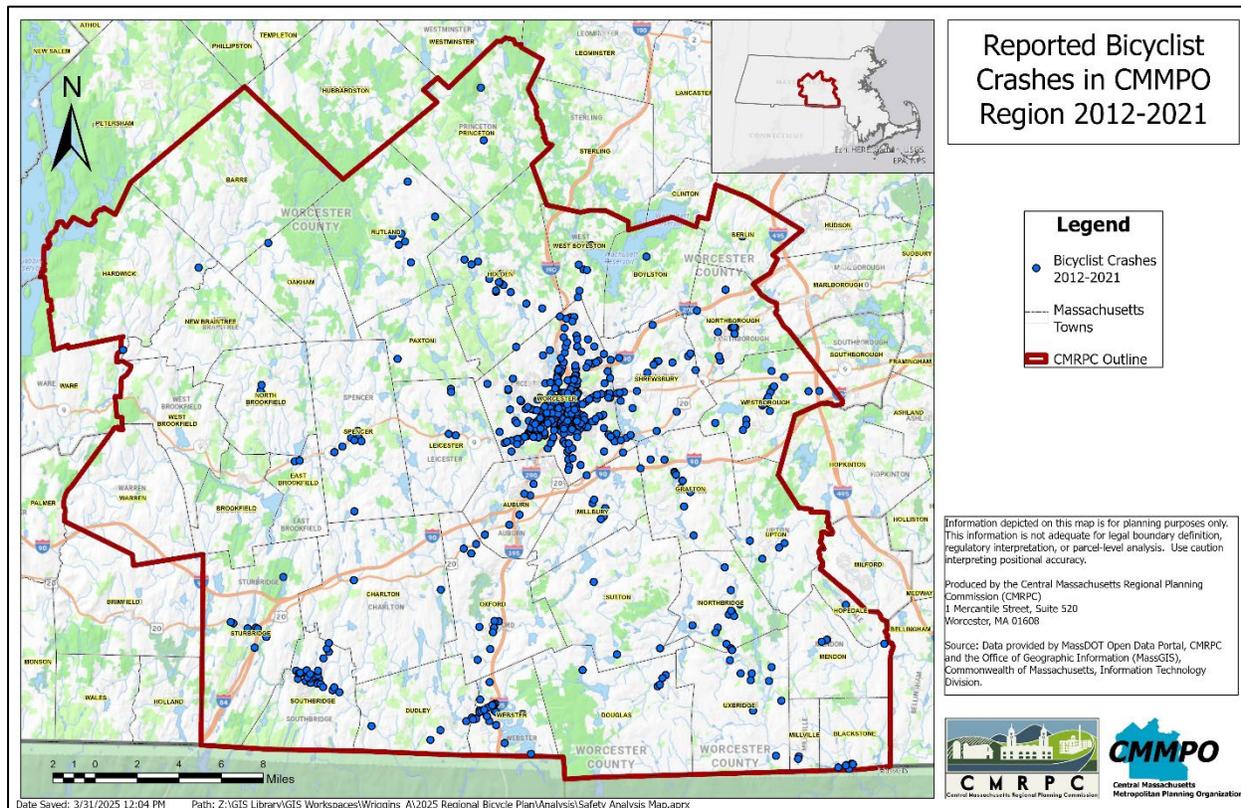
It is important to note that not all bicycle crashes are reported. There is a myriad of reasons why a person may choose not to report a bicycle crash. In a situation with minimal damage to people or property, involved parties may opt not to report the accident. Additionally, folks who lack health insurance or proper documentation may fear the consequences of reporting a bicycle crash through official channels, even if injury or serious injury has occurred.

In the context of bicyclist crash severity, a bicyclist crash involving a fatality is considered a “K” crash, and a bicyclist crash involving a serious injury is denoted by an “A”. Thus, “KA” crashes are bicyclist crashes that resulted in a serious injury or a fatality. This definition is used in the MassDOT Vulnerable Roadway User (VRU) Assessment, and in the analysis of this bicycle plan. To determine the number of KA crashes in the CMMPO region between 2012 and 2021, a query was used in ArcGIS Pro to isolate crashes with a reported maximum severity injury of “fatal injury,” “non-fatal, incapacitating injury,” or “suspected serious injury.”

Maps, Charts, Statistics, and Demographics

As shown in the map below, 773 bicycle crashes were reported in the CMMPO region between January 1, 2012 and December 31, 2021. Intuitively, the most significant cluster of reported bicycle crashes in the region is in the City of Worcester. There are smaller clusters of crashes in Southbridge and Webster, and isolated bicycle crashes throughout the region. Just 9.3% (72/773) of bicycle crashes occurred within 25 feet of where bicycle infrastructure currently exists. The number of bicycle crashes that occurred within 25 feet of where bicycle infrastructure existed at the time of the crash is likely even lower because the bicycle infrastructure may have been built after the crash in that location occurred.

Safety Map: All Reported Bicyclist Crashes in CMMPO Region, 2012-2021



Statistics and Demographics for All Bicyclist Crashes in CMMPO Region 2012 – 2021

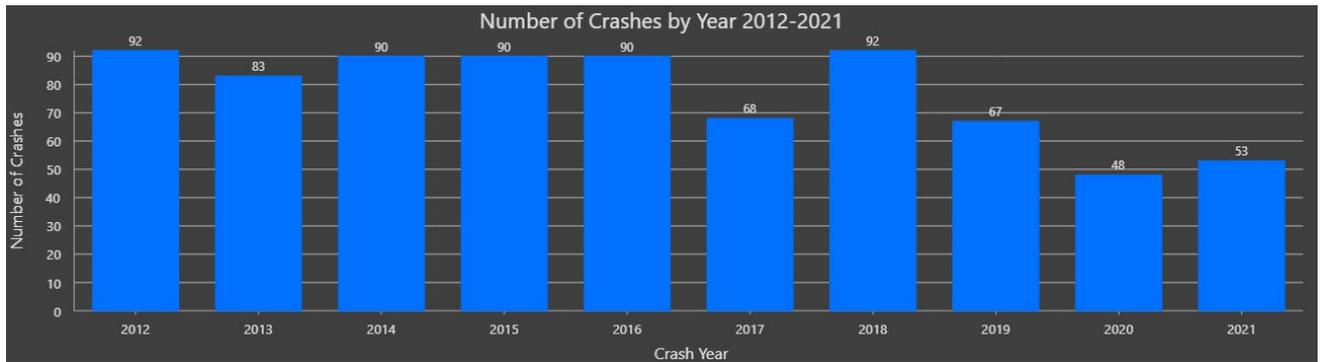
The total number of bicycle crashes in the CMMPO region by year hovered around 90 between 2012 and 2018. In 2020, the CMMPO region observed just 48 total bicycle crashes, which is largely due to significantly fewer vehicles on the road during the Covid-19 pandemic. While the data for 2022-2025 is still considered open, the total number of bicycle crashes has increased year-over-year from 48 in 2020 to 93 in 2024.⁴¹ This pattern is also reflected across the Commonwealth as a whole; the average number of bicycle crashes observed in Massachusetts per year between 2016 and 2019 was 1,367. In 2020, the total number of bicycle crashes statewide was down to 1,054; however, by 2024, the total number of bicycle crashes in Massachusetts was up to 1,552.⁴² The majority of research has shown that the reduction in traffic crashes during the Covid-19 pandemic was

⁴¹ MassDOT Impact Crash Data Portal, accessed May 2025.

⁴² Ibid.

a result of lower traffic volumes during that period.⁴³ While there was a dip in the number of bicycle crashes during the pandemic, evidence suggests that there is a lot of work to be done to actualize safer roadways.

Chart: Total Number of Reported Bicycle Crashes in CMMPO Region by Year 2012-2021

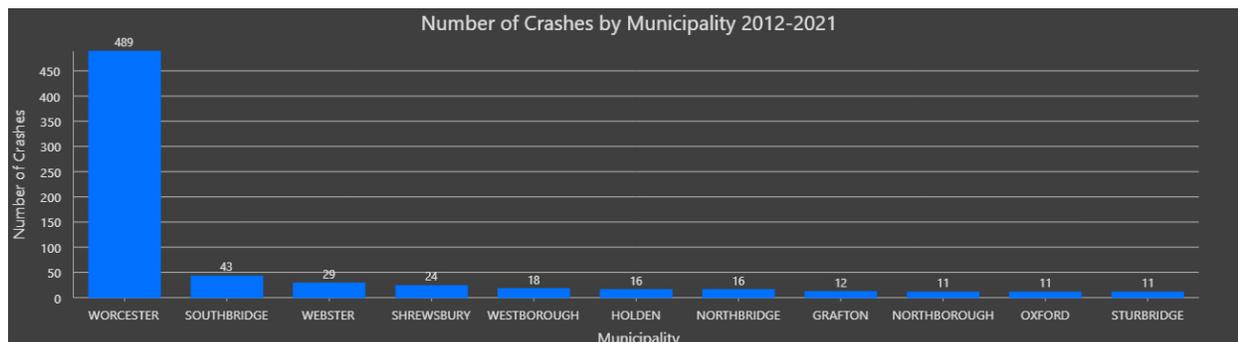


(Source: MassDOT Impact Crash Data Portal, accessed March 2025)

Out of 773 total bicycle crashes in the CMMPO region between 2012 and 2021, 489 (63%) occurred in Worcester. According to 2020 Census data, approximately 34% of the population of the CMMPO region reside in Worcester. While Worcester may be overrepresented within the CMMPO region based on population, the majority of bicycle accidents occur in urban areas, indicating these statistics are generally consistent with statewide and national averages. Five communities in the CMMPO region observed zero bicycle crashes between 2012 and 2021: Barre, Brookfield, New Braintree, Warren, and West Brookfield.

⁴³ Ebrahim Shaik and Samsuddin Ahmed, “An Overview of the Impact of COVID-19 on Road Traffic Safety and Travel Behavior,” *Transportation Engineering*. September 2022.

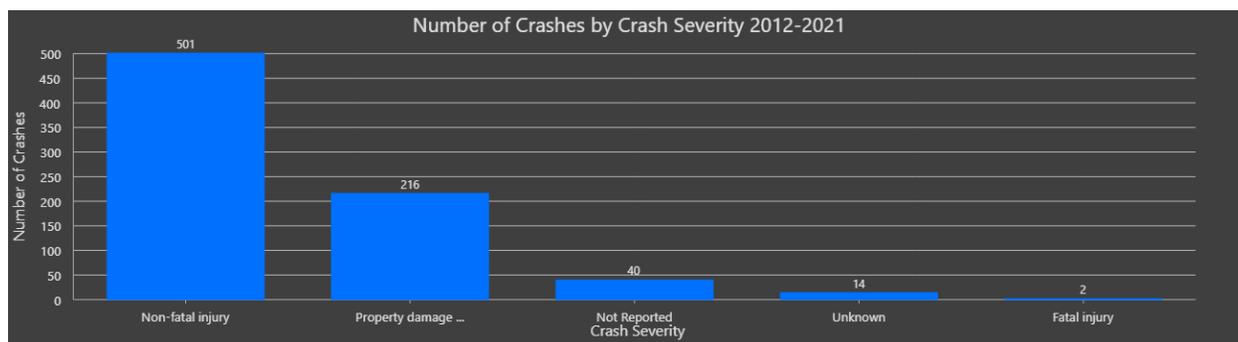
Chart: Number of Reported Bicycle Crashes by Municipality in CMMPO Region 2012-2021 (Municipalities with 10 or more Crashes)



(Source: MassDOT Impact Crash Data Portal, accessed March 2025)

As shown in the chart below, 501 out of 773 bicycle crashes, or 64.8%, resulted in some kind of non-fatal injury. Approximately 27.9% of bicycle crashes observed no personal injury and were categorized as property damage only. As such, 717 out of 773 bicycle crashes resulted in either a non-fatal injury or property damage only, accounting for 92.7% of bicycle crashes. It is important to note that a crash severity of Not Reported does not necessarily mean that nobody was injured in that crash. As explained in the methodology, there is a myriad of reasons why a person may choose not to report a bicycle crash, even if injury has occurred.

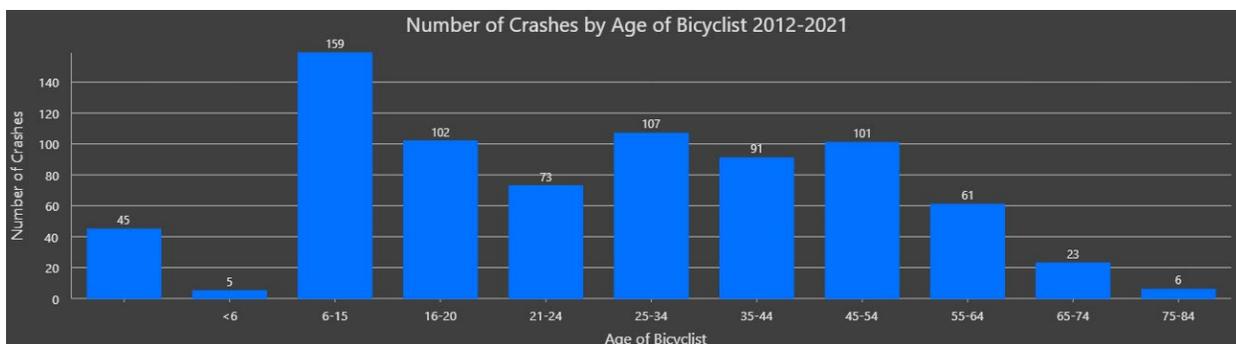
Chart: Number of Reported Bicycle Crashes in CMMPO Region by Crash Severity 2012-2021



(Source: MassDOT Impact Crash Data Portal, accessed March 2025)

As shown in the chart below, bicycle crashes affect all age groups. The highest frequency of crashes occurred in the 6-15 age group, with 159/773 or 20.5%. The next highest frequency of crashes occurred in the 25-34 age group, followed closely by the 16-20 and 45-54 age groups. While the 6-15 age group saw nearly 60% more bicycle crashes than the 45-54 age group, the 6-15 age group saw less than half as many fatal or serious injury (KA) crashes as the 45-54 age group. See the chart showing number of KA crashes by age of bicyclist for further analysis.

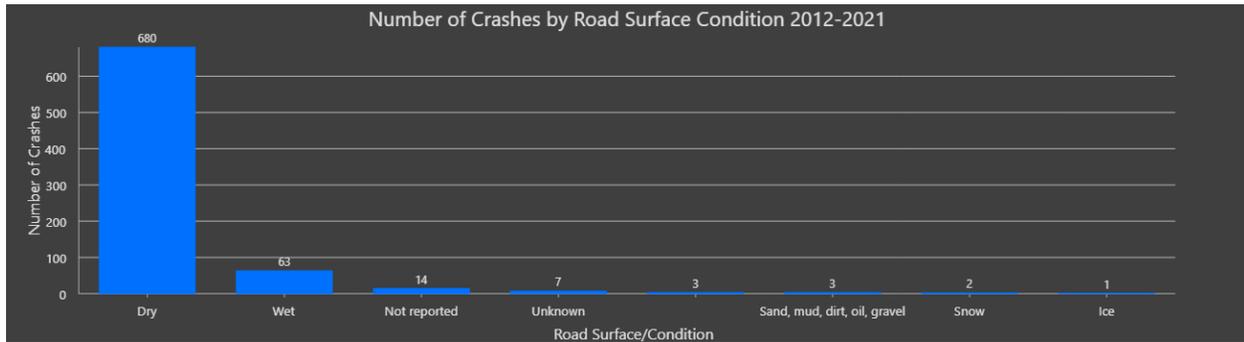
Chart: Number of Reported Bicycle Crashes in CMMPO Region by Age of Bicyclist 2012-2021



(Source: MassDOT Impact Crash Data Portal, accessed March 2025)

Approximately 88% (680/773) of bicycle crashes occurred during dry road surface conditions; adverse weather is not to blame for most bicycle crashes. Just over 8% (63/773) of crashes occurred during wet road surface conditions. While wet, snowy, icy, or generally unstable road surface conditions can contribute to a crash, most crashes occur during dry road surface conditions, suggesting that additional safety measures must be considered.

Chart: Number of Reported Bicycle Crashes in CMMPO Region by Road Surface Condition 2012-2021

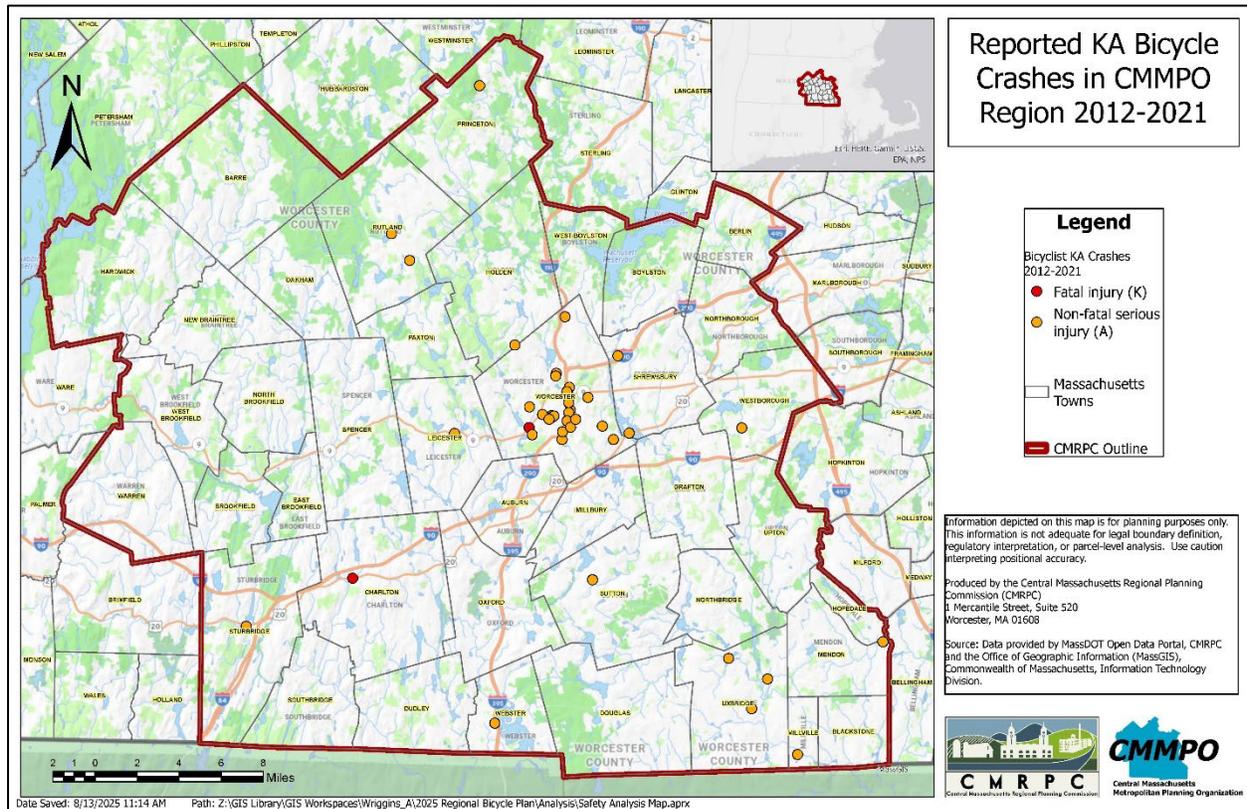


(Source: MassDOT Impact Crash Data Portal, accessed March 2025)

An important portion of analysis in this plan is focused on fatal (K) and serious injury (A) crashes. A serious injury is an injury which requires hospitalization and often includes some sort of incapacitation. While all crashes are important to consider when analyzing safety in a given geographic area, special attention must be given to KA crashes, as these are the types of crashes that are preventable. While humans will continue to make mistakes, measures can be taken to reduce the severity of crashes when they do occur.

The map below shows the locations of fatal or serious injury bicycle crashes (KA crashes) throughout the CMMPO from 2012-2021. Fatal injury crashes (K) are symbolized as red dots on the map, and non-fatal serious injuries (A) are symbolized as orange dots. Out of the 42 KA bicycle crashes between 2012 and 2021, just one occurred within 25 feet of existing bicycle infrastructure. This crash occurred in Rutland on an on-road portion of the Mass Central Rail Trail (MCRT) at the intersection of Depot Road, Miles Road, and Moulton Mill Road only 47 feet from where the MCRT becomes off-road. The location of this crash lends support to the notion that municipalities should pay close attention to access points to off-road bicycle infrastructure and ensure that the on-road portions do not compromise safety. While 72 bicycle crashes between 2012 and 2021 occurred within 25 feet of a location where bicycle infrastructure currently exists, only 1 of these (1.4%) resulted in a KA injury.

Safety Map: All Reported KA Bicycle Crashes in CMMPO Region by Crash Severity 2012-2021

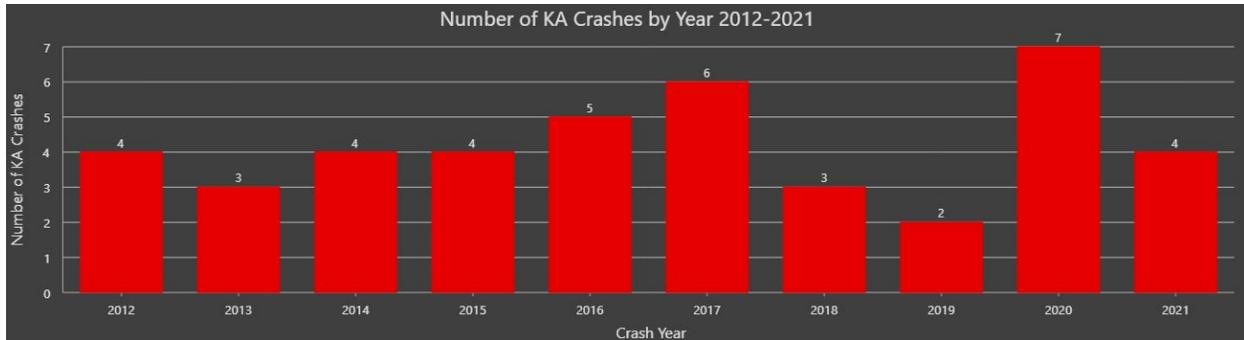


Demographics and Statistics for KA Bicyclist Crashes in CMMPO Region

There are a couple of key takeaways when analyzing the number of KA crashes by year. First, the average number of KA crashes per year over the 10-year period examined is 4.2. While just one death or serious injury is unacceptable, 4.2 is low enough to lend support to the notion that zero KA crashes is achievable. Another observable trend is the decline leading up to the Covid-19 pandemic before spiking during the pandemic. In 2017, there were 6 KA crashes in the region; in 2018 there were 3 KA crashes in the region; in 2019 there were 2 KA crashes; in 2020 there were 7 KA crashes. This trend lends support to the notion that higher speeds cause more KA crashes. During the Covid-19 pandemic, there were fewer cars on the road, meaning fewer potential conflict points with cars; however, since there were fewer cars on the road, the cars that were on the road consistently drove at higher speeds. If the proper safety measures are not incorporated into roadway design, an empty roadway can feel like an invitation to drive at high speeds. While there might have

been fewer potential conflict points between cars and bicyclists due to the reduced number of cars, the conflicts were much more serious when they did occur due to the higher speeds at which cars were traveling during the Covid-19 pandemic. This explanation accounts for the higher number of KA crashes in 2020 than any other year from 2012-2021.

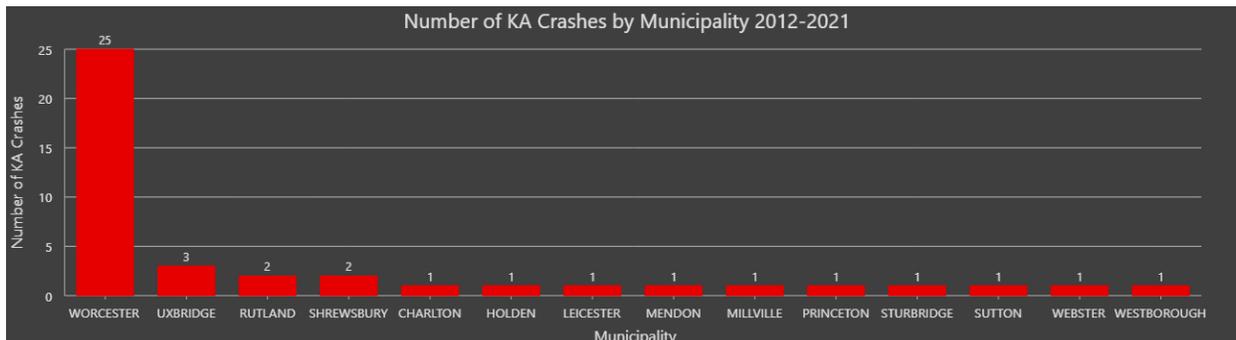
Chart: Number of Reported KA Bicycle Crashes in CMMPO Region by Year 2012-2021



(Source: MassDOT Impact Crash Data Portal, accessed March 2025)

The trends observed when examining KA crashes by municipality are generally consistent with statewide and national patterns: the majority of KA bicycle crashes occur in urban areas.. Using data from the chart below, the rate of KA crashes can be calculated. For example, Worcester observed 489 bicycle crashes between 2012 and 2021, 25 of which resulted in a serious injury or fatality. Thus, Worcester’s KA crash rate is 5.1%; in other words, 5.1% of bicycle crashes in Worcester between 2012 and 2021 resulted in a serious injury or fatality. For communities with low numbers of bicycle crashes, the KA crash rate may not indicate much; for example, out of 2 total bicycle crashes in Millville between 2012 and 2021, one resulted in a KA injury, making Millville’s KA crash rate 50%. For the city of Worcester, KA crash rate could be calculated for specific roadway segments to highlight areas with a high KA crash rate, which could be helpful in the prioritization of safety improvement projects. If a municipality is not in the chart below, that municipality did not observe any KA bicycle crashes between 2012 and 2021.

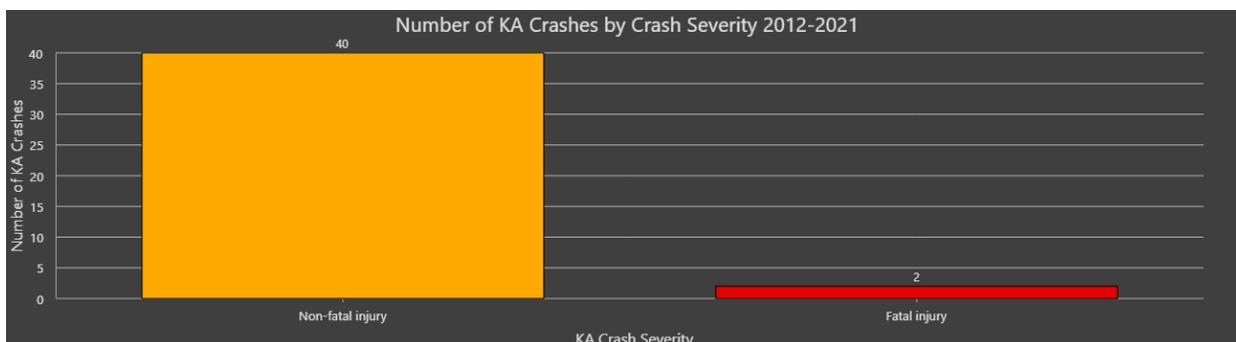
Chart: Number of Reported KA Bicycle Crashes in CMMPO Region by Municipality 2012-2021



(Source: MassDOT Impact Crash Data Portal, accessed March 2025)

Out of 42 crashes that resulted in a fatality or a serious injury, 2 crashes resulted in a fatality. The remaining 40 KA crashes all resulted in a non-fatal serious injury, as shown in the map of all reported KA crashes from 2012-2021 above. The orange color in the chart below shows non-fatal serious injuries, corresponding to the orange color on the map above showing KA crashes by crash severity.

Chart: Number of Reported KA Bicycle Crashes in CMMPO Region by Crash Severity 2012-2021

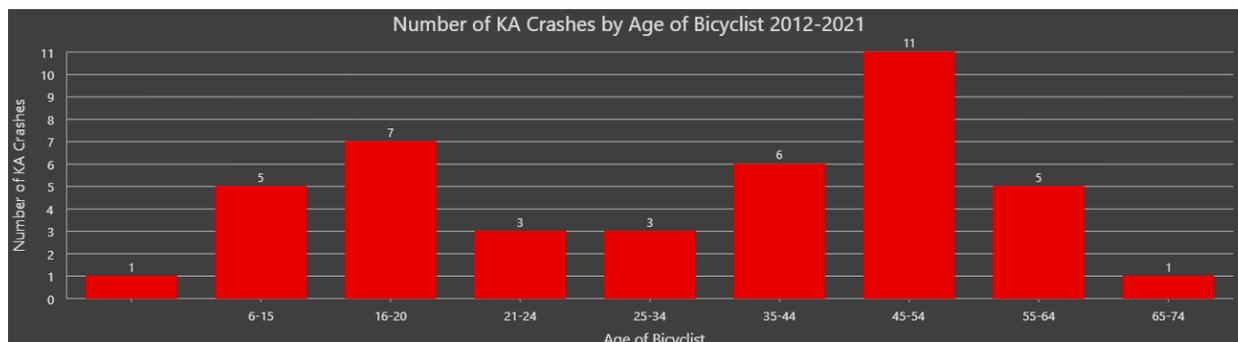


(Source: MassDOT Impact Crash Data Portal, accessed March 2025)

An analysis of the age of the bicyclists of KA crashes during 2012-2021 reveals that no age group is safe from KA crashes—all age groups had at least one KA crash. The age group with the highest frequency of KA crashes is 45-54 with 11 KA crashes. By contrast, the age group with the highest frequency of any bicycle crash is 6-15 with 159 total crashes. The age

group with the next highest frequency of any bicycle crash is 25-34 with 107 total crashes. While people aged 6-15 got in significantly more bicycle crashes than people aged 45-54 during 2012-2021, people aged 45-54 were in more than twice as many KA crashes than people aged 6-15. This trend may reflect the type of bicycling that certain age groups commonly engage in. For example, bicyclists in the age groups of 35-64 may be more likely to bike for fitness or recreational purposes in a more competitive manner, while bicyclists in the 6-20 age groups may be more likely to bike for transportation purposes (or casually for fun), as most folks in this age group are too young to legally operate a motor vehicle. Bicycling in a competitive manner for fitness purposes would likely result in biking along roadways with higher speeds compared to biking for transportation purposes on slower speed roadways throughout Worcester and beyond. While there were more bicycle crashes in the 6-15 age group, these crashes resulted in less severe outcomes. This analysis also could explain why bicyclists in the 45-54 age group saw more severe crash outcomes, as bicycle crashes on higher speed roadways result in more severe crash outcomes.

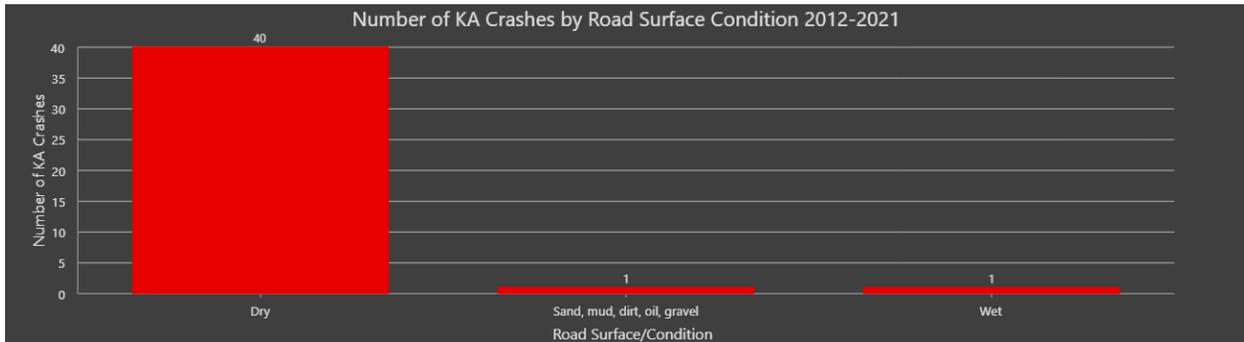
Chart: Number of Reported KA Bicycle Crashes in CMMPO Region by Age of Bicyclist 2012-2021



(Source: MassDOT Impact Crash Data Portal, accessed March 2025)

An analysis of the road surface condition at the time of KA crashes reveals that potentially hazardous weather (rain or snow, e.g.) is not the cause of most KA crashes. Only two out of 42 KA crashes occurred when the road surface was wet or in the sand, mud, dirt, oil, gravel category. Further, both fatal bicycle crashes between 2012 and 2021 occurred during dry road surface conditions.

Chart: Number of Reported KA Bicycle Crashes in CMMPO Region by Road Surface Condition 2012-2021



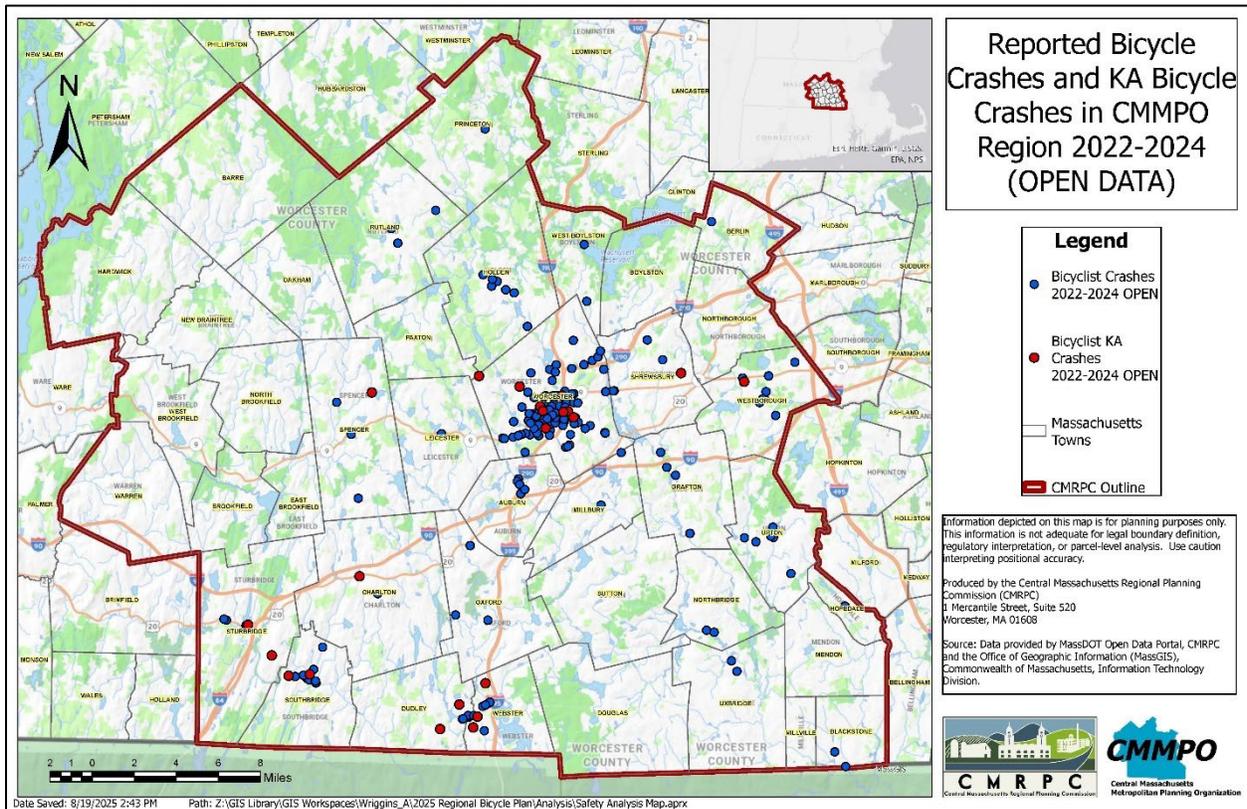
(Source: MassDOT Impact Crash Data Portal, accessed March 2025)

Open Data Safety Analysis

The map below shows reported bicycle crashes in the CMMPO region from 2022-2024 to give an understanding of the general post-pandemic trends. It is important to keep in mind that this data is still considered open, and thus subject to change. The reported bicycle crashes on the map below are symbolized by crash severity; bicycle crashes that did not result in serious injury or fatality are shown in blue, while KA bicycle crashes are shown in red.

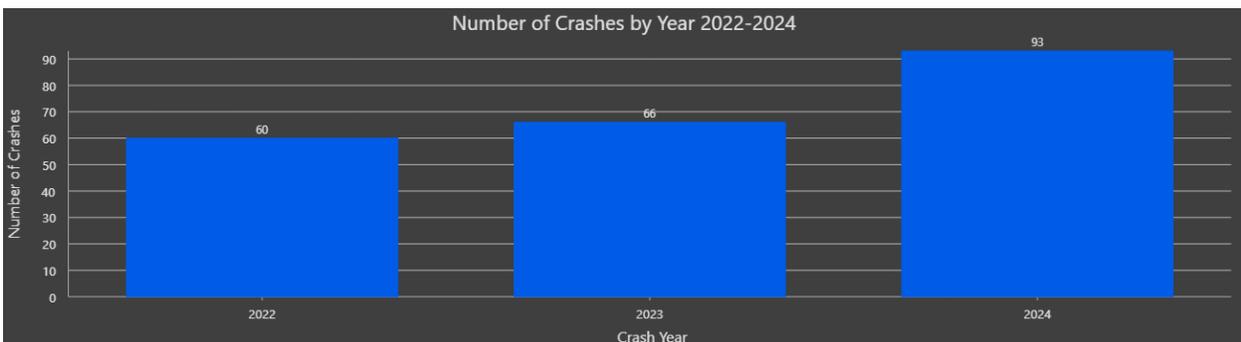
2025 REGIONAL BICYCLE PLAN

Open Data Map: All Reported Bicycle Crashes and KA Bicycle Crashes in CMMPO Region 2022-2024



While the total number of reported bicycle crashes declined from 2018 to 2020, the post-pandemic trend has been a steady, year-over-year increase in number of reported bicycle crashes from 2020 through 2024, as shown in the chart below.

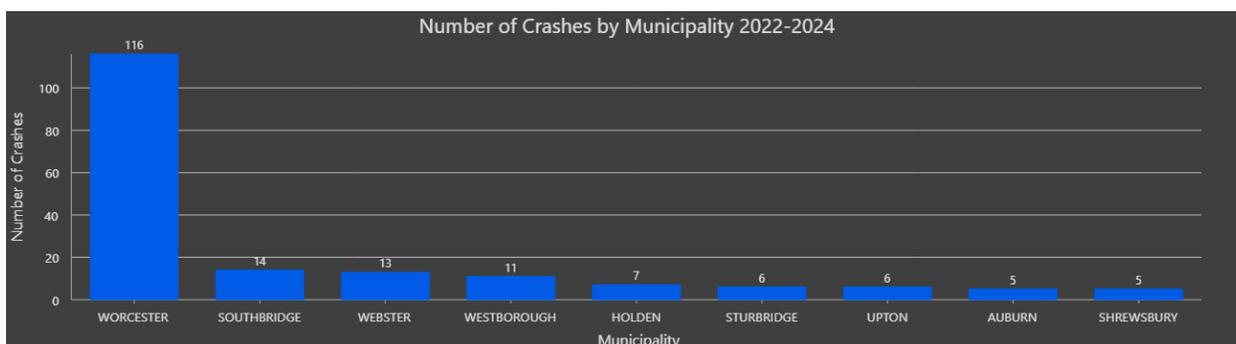
Open Data Chart: Number of Reported Bicycle Crashes in CMMPO Region by Year 2022-2024



(Source: MassDOT Impact Crash Data Portal, accessed August 2025)

When examining the number of reported bicycle crashes by municipality during the past three years, there are some differences when compared with the most recent 10-year window of closed data from 2012-2021. During the 2012-2021 time period, approximately 63% of bicycle crashes occurred in Worcester; during the 2022-2024 time period, approximately 53% of bicycle crashes occurred in Worcester. It is difficult to determine the reason(s) for this shift, as the data is still open, but one possible explanation is that there have been several notable improvements to bicycle infrastructure within Worcester in the past 3-4 years. This could account for the reduced proportion of crashes Worcester is observing as compared with the rest of the CMMPO region. In any case, the handful of communities that observe the second- third- and fourth-highest number of bicycle crashes after Worcester remains consistent: Southbridge, Webster, Westborough, and Holden.

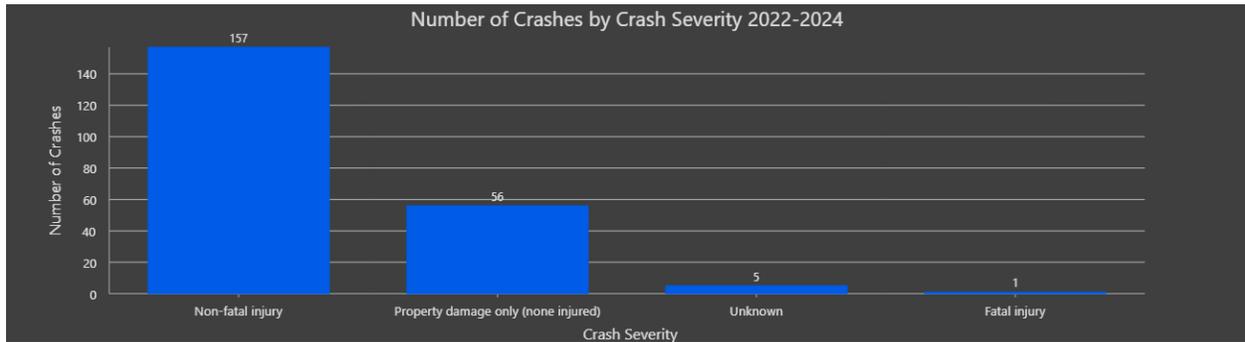
Open Data Chart: Number of Reported Bicycle Crashes in CMMPO Region by Municipality (Municipalities with 5 or more crashes)



(Source: MassDOT Impact Crash Data Portal, accessed August 2025)

Compared with the data from 2012-2021, the open data from 2022-2024 reflects similar proportions of injury vs no injury, with a slight increase in crashes resulting in non-fatal injury. Approximately 71.6% of reported bicycle crashes between 2022 and 2024 resulted in a non-fatal injury, as compared with 64.8% for the 2012-2021 time period. Approximately 25.6% (down from 27.9% during the 2012-2021 time period) of reported bicycle crashes between 2022 and 2024 resulted in property damage only, meaning nobody was injured in these crashes.

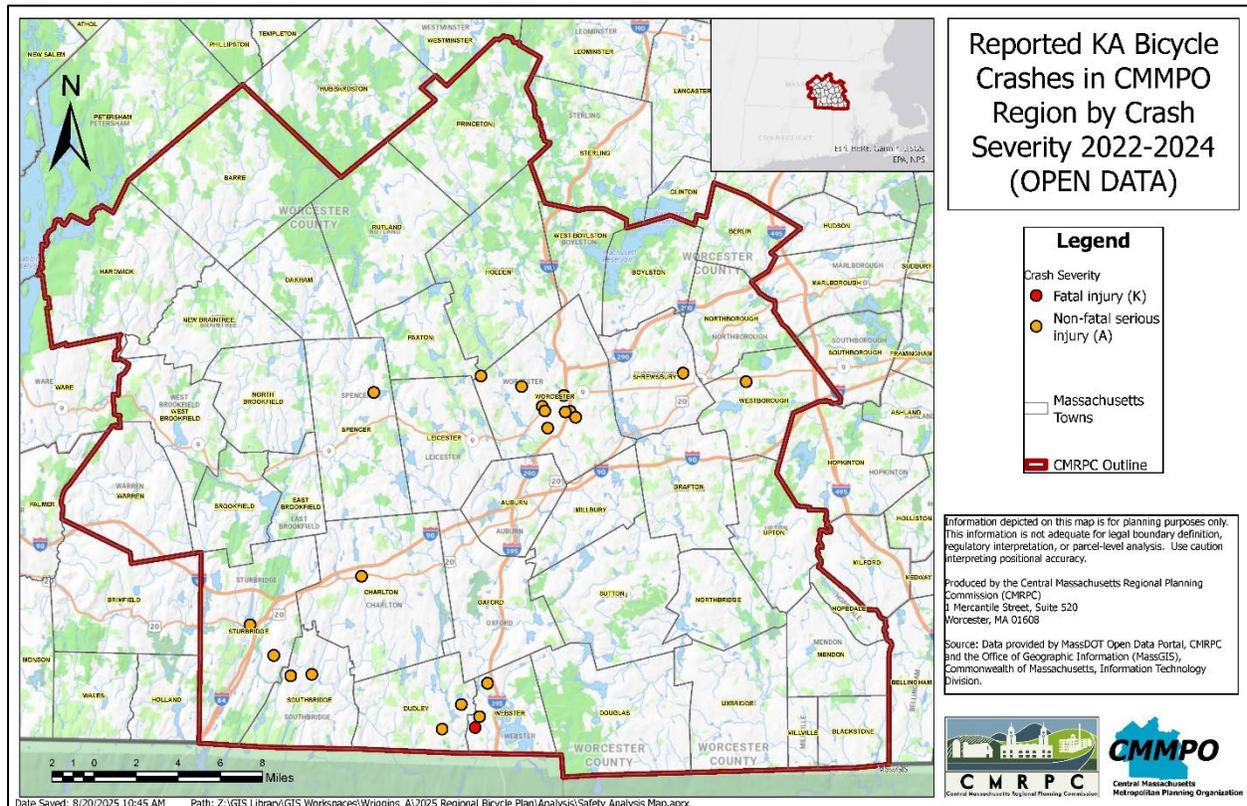
Open Data Chart: Number of Reported Bicycle Crashes in CMMPO Region by Crash Severity 2022-2024



(Source: MassDOT Impact Crash Data Portal, accessed August 2025)

The map below shows all reported KA bicycle crashes in the CMMPO region between 2022 and 2024 by crash severity. The single fatal bicycle crash from this time period occurred in Webster. The fatal injury crash (K) is symbolized as a red dot on the map, and non-fatal serious injuries (A) are symbolized as orange dots. During the three-year period of open data examined (2022-2024), there were a total of 26 KA crashes. Eleven of these KA crashes occurred in Worcester. Out of 116 total bicycle crashes in Worcester between 2022-2024, 11 resulted in KA injuries, meaning Worcester’s KA crash rate for this time period is 9.4%. For the 10-year period from 2012-2021, Worcester’s KA crash rate was 5.1%. This increase in KA crash rate is consistent with the increase in total crashes from 2020-2024 but shows that the severity of crash outcomes has gotten worse in recent years. This demonstrates the need for improved safety interventions to reduce the severity of bicycle crash outcomes.

Open Data Map: All Reported KA Bicycle Crashes in the CMMPO Region by Crash Severity 2022-2024



(Source: MassDOT Impact Crash Data Portal, accessed August 2025)

MassDOT Vulnerable Road User Assessment

The [MassDOT Vulnerable Road User \(VRU\) Assessment](#) is a document that analyzes State safety performance with respect to individuals who are deemed to be particularly vulnerable users of the transportation network. MassDOT uses a data-driven approach to identifying vulnerable road users and emphasizes fatal and serious injuries. The VRU Assessment is guided by Vision Zero, the Safe Systems Approach, and the six initiatives established in the Commonwealth’s Strategic Highway Safety Plan (SHSP).

The VRU Assessment incorporates an analysis of the factors involved in VRU fatal and serious injury (KA) crashes to reveal patterns and trends and to guide the selection of appropriate countermeasures/strategies to reduce future KA crashes. Factors for this

analysis include road characteristics, area type, proximity to transit and schools, impairment, and community-based socioeconomic data.⁴⁴

Another central piece of the VRU Assessment is the identification of primary risk intersections and road segments. To determine these geographic areas of high risk, MassDOT used both a reactive (crash-based) and proactive (risk-based) approach. For the crash-based approach, historical crash frequency at specific locations was examined as one aspect of VRU safety. For the risk-based approach, roadway and community characteristics associated with a higher risk of pedestrian or bicyclist KA crashes were considered.⁴⁵ The risk-based analysis included the following roadway attributes: functional classification, traffic volumes, median presence, number of lanes, intersection type, and intersection control type. The risk-based analysis included the following community-based factors: employment density, population density, zero vehicle households, proportion of employment in food service, retail, and accommodation, proportion of population living in poverty, median household income, environmental justice communities, and transit stops.

Regional Environmental Justice Plus (REJ+)

Regional Environmental Justice Plus (REJ+) refers to a data-driven designation used to identify communities that are especially vulnerable to transportation-related impacts.

Environmental Justice designations are considered “regional” because the characteristics that designate REJ+ status are considered in relation to regional percentiles. The MassDOT REJ+ definition is as follows:

At least one of three EJ criteria must be true:

- **Income:** annual median household income \leq MPO 25th percentile.
- **Race and ethnicity:** percentile of individuals that identify as Hispanic or Latino; Black or African American; American Indian or Alaska Native; Asian; Native Hawaiian or Other Pacific Islander; some other race or two or more races that do not identify as White alone \geq MPO 75th percentile.
- **Limited English-speaking Proficiency (LEP):** percentile of households with limited English-speaking members \geq MPO 75th percentile.

⁴⁴ MassDOT Vulnerable Road User Safety Assessment. 2023.

⁴⁵ Ibid.

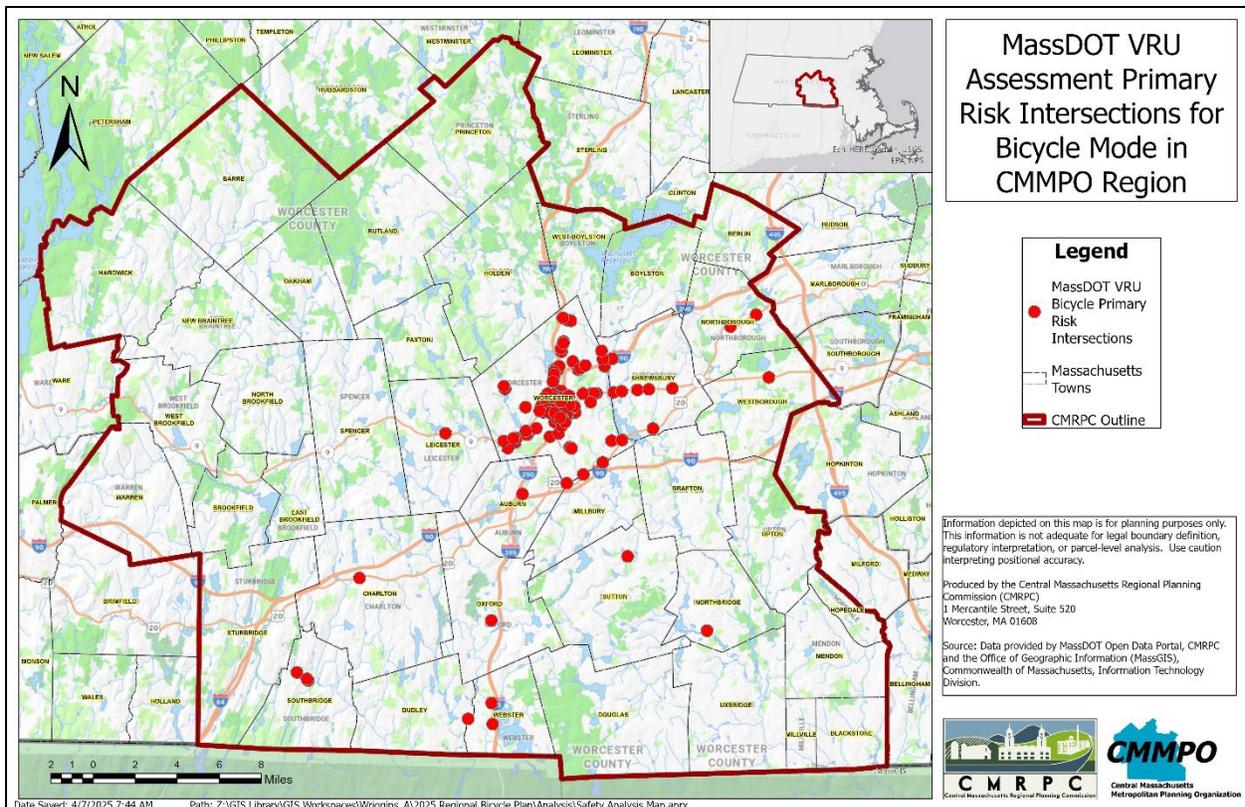
At least one of the following three transportation criteria must be true:

- Percent of Households with **Zero Vehicles** \geq MPO 75th percentile
- Percent of Households with **Disabilities** \geq MPO 75th percentile
- Percent of **Older Adults (65+ years)** \geq MPO 75th percentile

A series of maps below shows primary risk intersections and road segments, as determined by the MassDOT VRU Assessment, throughout the CMMPO region and includes an analysis of bicycle crash locations through a Regional Environmental Justice Plus (REJ+) lens.

While there are some primary risk intersections scattered throughout the southern and eastern subregions of the CMMPO region, many of the primary risk intersections are in Worcester. Route 9 contains 5 primary risk intersections in Shrewsbury, and Route 20 contains 7 primary risk intersections throughout the CMMPO region.

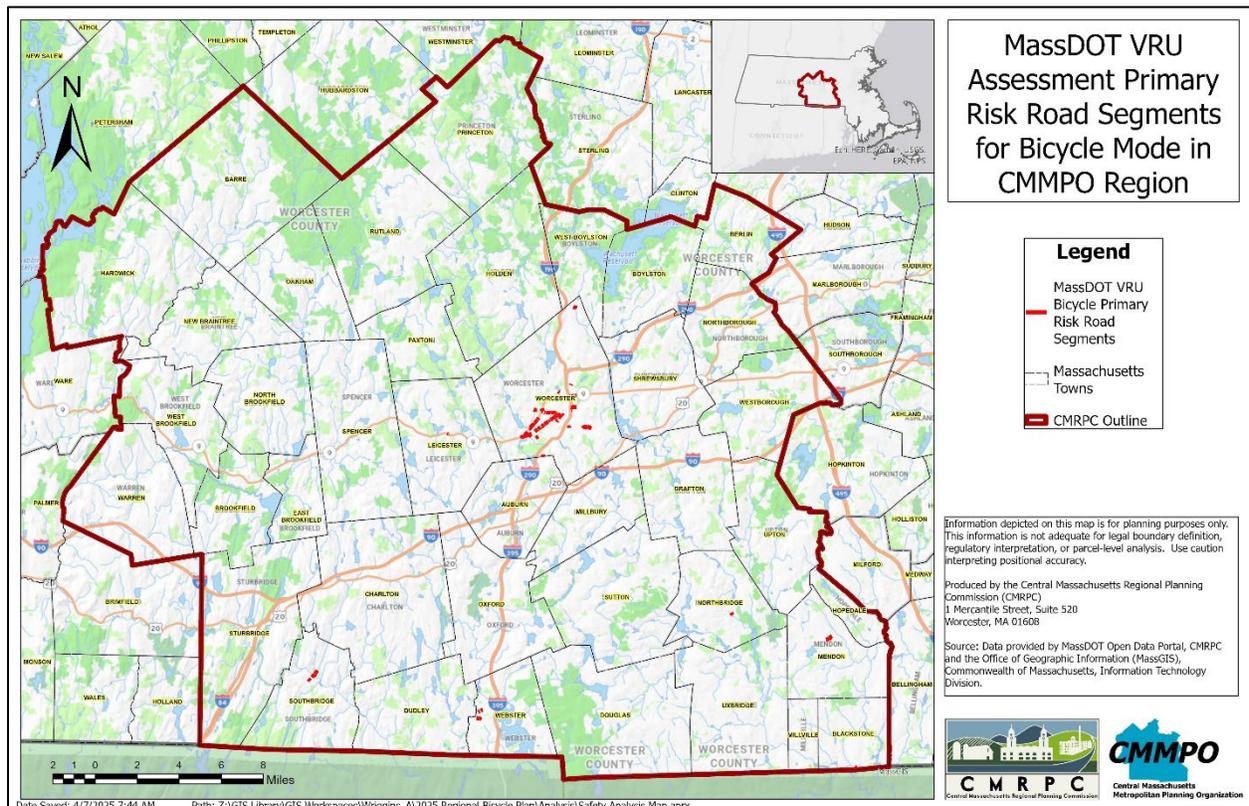
Safety Map: MassDOT VRU Assessment Primary Risk Intersections in CMMPO Region for Bicycle Mode



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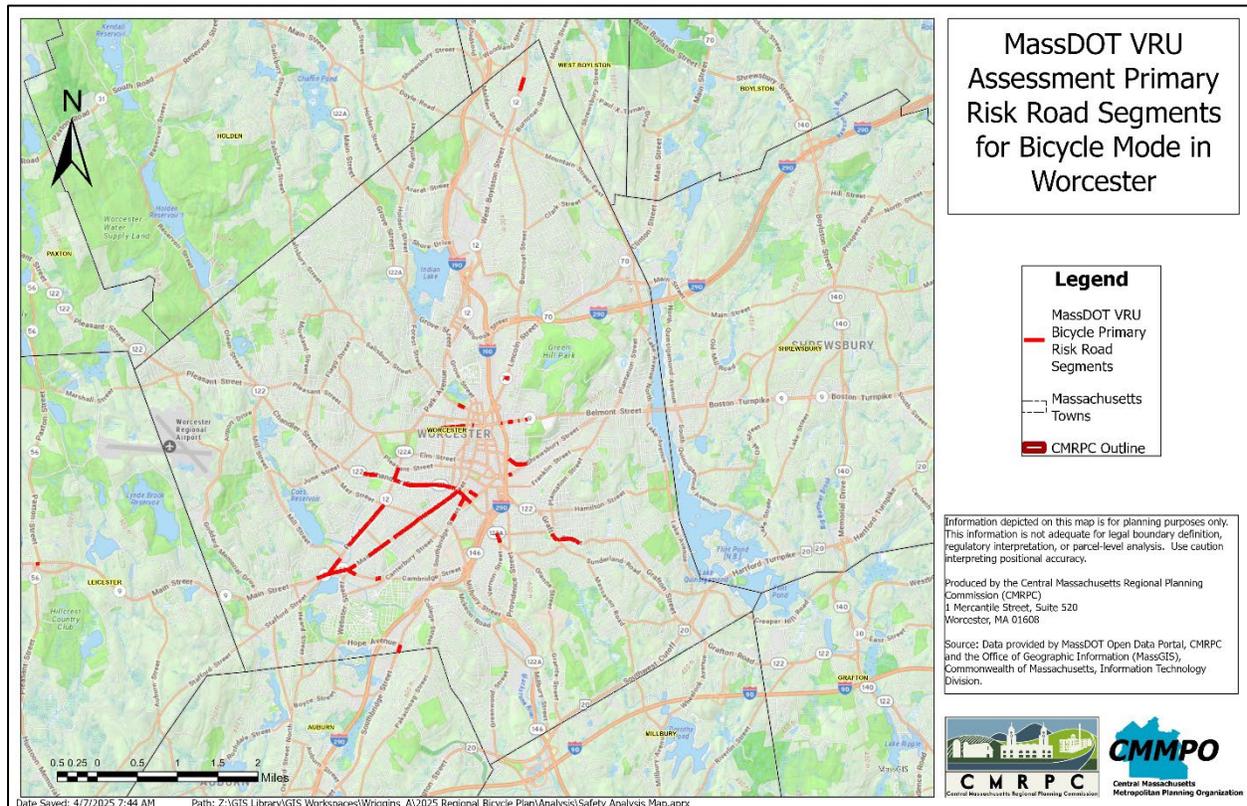
The vast majority of CMMPO region primary risk road segments identified in the 2023 MassDOT VRU Assessment are located in Worcester. Still notable, however, are small clusters of primary risk road segments in Southbridge, Webster, Mendon, and Northbridge. The map below shows primary risk road segments throughout the CMMPO region.

Safety Map: MassDOT VRU Assessment Primary Risk Road Segments in CMMPO Region for Bicycle Mode



The map below shows a closer, more detailed view of the primary risk road segments in Worcester. It reveals that many of the riskiest road segments to ride a bicycle on in Worcester are located on Main Street, Park Avenue, and Chandler Street. According to a crash hotspot analysis in the [Worcester Vision Zero Plan](#), these three roadways were determined to be crash hotspots.

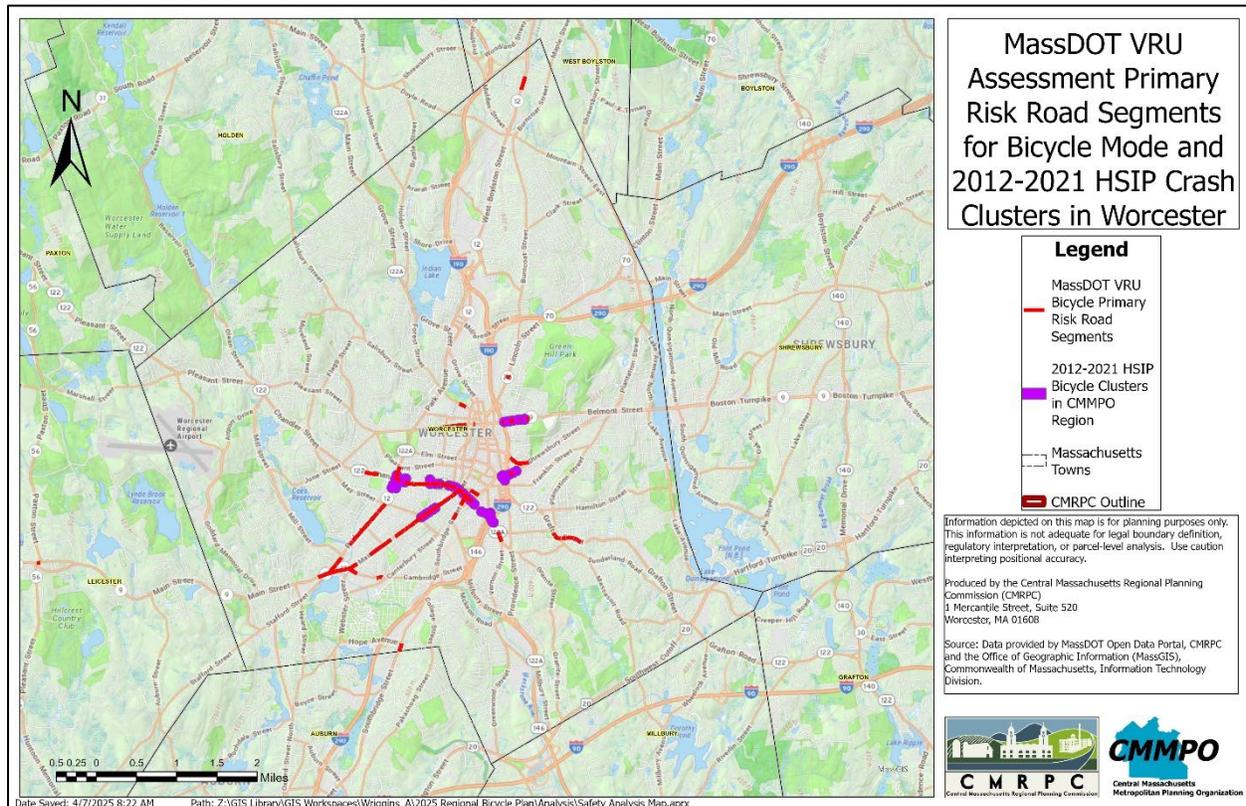
Safety Map: MassDOT VRU Assessment Primary Risk Road Segments in Worcester for Bicycle Mode



As shown in the map below, there is significant overlap between the 2012-2021 HSIP Crash Clusters⁴⁶ and the road segments identified as Primary Risk in the MassDOT VRU assessment. As stated in MassDOT’s VRU Assessment methodology, the presence of HSIP crash cluster was a factor in determining whether or not a road segment was considered “primary risk.” Flagged by both the MassDOT VRU Assessment and the Worcester Vision Zero Plan, these road segments represent high priority roadways for both the City of Worcester and the Commonwealth.

⁴⁶ HSIP Crash Clusters are defined as the top 5% of bicycle crash clusters for each Regional Planning Agency between the years of 2012-2021.

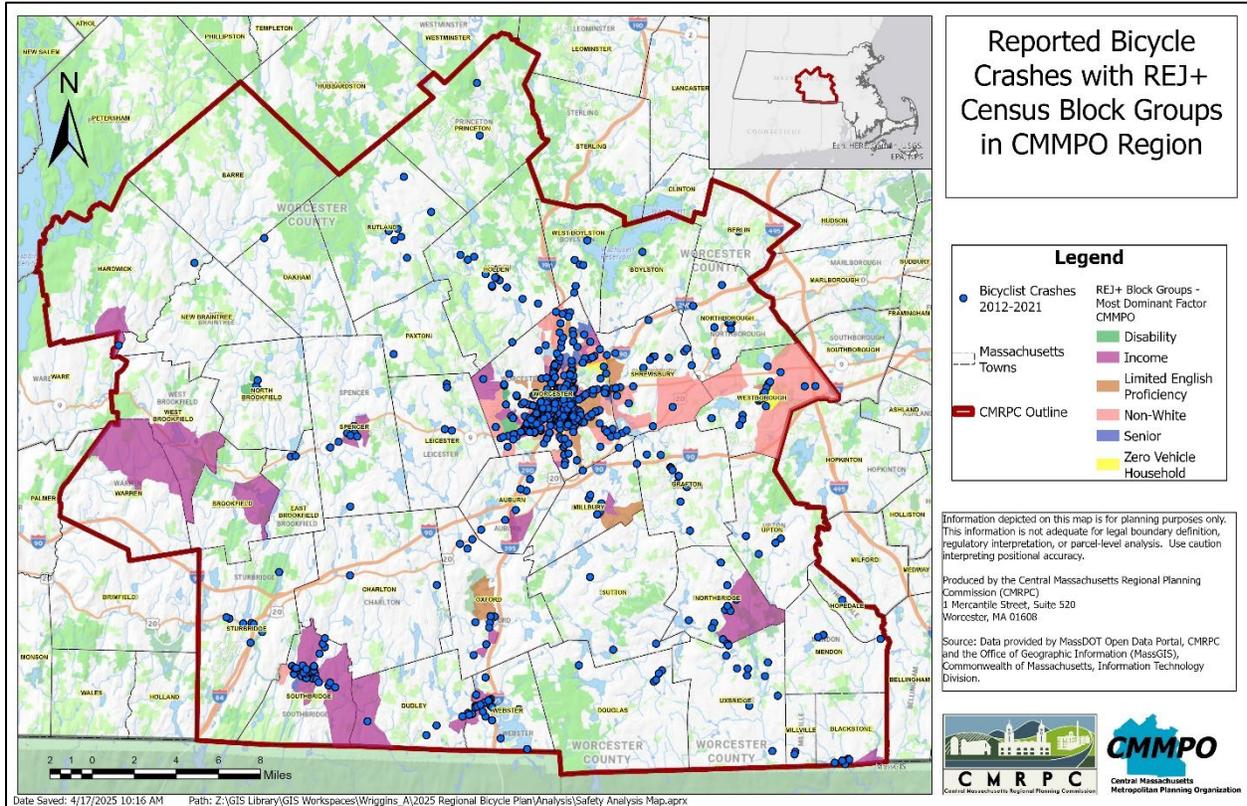
Safety Map: MassDOT VRU Assessment Primary Risk Road Segments and 2012-2021 HSIP Crash Clusters in Worcester



From a broad perspective, individuals living in REJ+ census block groups have a much higher chance of being located near intersections and/or road segments deemed primary risk by MassDOT’s VRU Assessment. Out of 393 total census block groups in the CMMPO region, 159 (40.45%) are considered REJ+ block groups. In the maps below, REJ+ census block groups are shown by most dominant REJ+ factor. Factors include low income, disability, non-White, Limited English Proficiency (LEP), older adults, and zero vehicle household (ZVHH).

Out of 773 total bicycle crashes during 2012-2021 in the CMMPO region, 526 occurred inside census block groups with an REJ+ designation. This accounts for 68% of bicycle crashes. Transportation-disadvantaged populations rely more heavily on biking and walking as a form of transportation. As such, bicycling is more common in these geographic areas, regardless of the presence of safe, comfortable, and convenient bicycle infrastructure. The combination of these factors results in a situation where more bicycle crashes are occurring in these census block groups than anywhere else in the CMMPO region.

Safety Map: Bicycle Crashes with REJ+ Most Dominant Factor



Out of these 526 crashes that occurred within REJ+ census block groups, the breakdown by most dominant REJ+ factor is shown in the table below.

Since the borders of census block groups are often on roadways, and bicycle crashes are often in roadways, it is not infrequent for a bicycle crash to be directly adjacent to a specific census block group. For this reason, an additional query was performed to quantify the number of crashes within a distance of 25 feet from a REJ+ census block group. Out of 773 total crashes, 576 were either inside or within a distance of 25 feet from a census block group with an REJ+ designation. This accounts for 74.5% of bicycle crashes. However, a particular bicycle crash may be within 25 feet of more than one census block group with an REJ+ designation. This explains why there are two different total numbers for the number of bicycle crashes within 25 feet of census block groups.

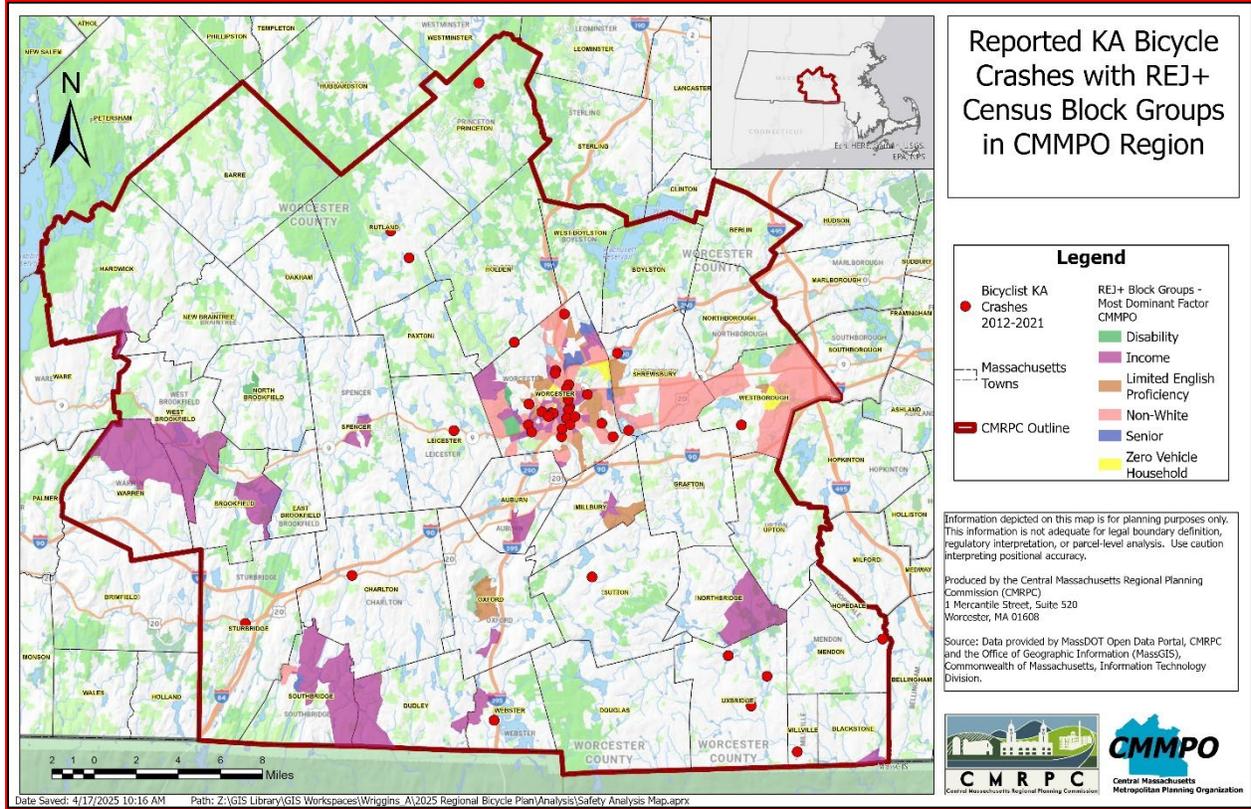
Table: Number of Bicycle Crashes Within or Close to REJ+ Census Block Groups 2012-2021

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Most Dominant REJ+ Factor	Number of Bicycle Crashes Within Corresponding Census Block Groups	Number of Bicycle Crashes Within 25 feet of Corresponding Census Block Groups
Income	252	341
Nonwhite	157	211
Limited English Proficiency (LEP)	66	112
Zero Vehicle Households (ZVHH)	35	82
Senior	9	15
Disability	7	17
Total	526	576* 778**

The same analysis performed on KA bicycle crashes reveals that 52.3% (22/42) of KA bicycle crashes occurred within a census block group with an REJ+ designation. While 68% of all bicycle crashes from 2012-2021 occurred inside a census block group with an REJ+ designation, 52.3% of KA bicycle crashes from the same time period occurred inside a census block group with an REJ+ designation. The KA crash rate for bicycle crashes that occurred in REJ+ designated census blocks group was approximately 4.2%, while the KA crash rate for bicycle crashes that occurred outside REJ+ designated census block groups was approximately 8.1%. This trend may be explained by higher motorist speeds in suburban and rural contexts—crashes at higher speeds are more likely to result in KA injuries. In the CMMPO region, there are fewer census block groups with an REJ+ designation in suburban and rural locations as compared with urban locations. In other words, crashes that occur within REJ+ designated census block groups are more likely to be lower speed crashes, which may result in fewer KA crash injuries. Conversely, when a bicycle crash occurs in suburban or rural locations, it is often on a roadway with higher motor vehicle speeds than in urban contexts. In such instances, the severity of crash outcomes is likely to be worse than crashes that occur on roadways with lower speeds. While individuals who reside in REJ+ designated census block groups live closer to more riskier locations and observe a higher percentage of bicycle crashes, nobody is completely safe from KA crashes. Significantly, 100% of the KA crashes that occurred in Worcester occurred inside or within 25 feet of an REJ+ designated census block group. The map below shows KA bicycle crashes from 2012-2021 with REJ+ designated census block groups in the CMMPO region.

Safety Map: KA Bicycle Crashes from 2012-2021 with REJ+ Most Dominant Factor



When the analysis was adjusted to include KA bicycle crashes within 25 feet of a census block group with an REJ+ designation, this percentage grew to 59.5% (25/42). All 25 KA bicycle crashes that occurred within an REJ+ census block group occurred in Worcester, and 100% of KA bicycle crashes that occurred in Worcester were located inside or within 25 feet of a census block group with an REJ+ designation.

Table: Number of KA Bicycle Crashes Within or Close to REJ+ Census Block Groups 2012-2021

Most Dominant REJ+ Factor	Number of KA Bicycle Crashes Within Corresponding Census Block Groups	Number of KA Bicycle Crashes Within 25 feet of Corresponding Census Block Groups
Income	9	10
Nonwhite	9	13
Limited English Proficiency (LEP)	3	6
Zero Vehicle Households (ZVHH)	0	5
Senior	0	0
Disability	1	1
Total	22	25* 35**

Safety Analysis Conclusion

An examination of crash data from 2012-2021 revealed that there is a lot of work to be done to achieve safer roadways for all users of the transportation network in Central Massachusetts. While the Covid-19 pandemic temporarily reduced the number of vehicles on the road, the number of severe bicycle crashes increased significantly from 2019 to 2020. While data for 2022-2025 is still considered “open,” preliminary analysis shows that the number of bicycle crashes has been increasing year-over-year since 2020 across the CMMPO region and statewide. In alignment with the principles of Vision Zero and the Safe Systems Approach, the safety analysis in this plan reveals that the occurrence of fatal or serious injury (KA) crashes in locations with dedicated bicycle infrastructure is extremely low—only one out of 72 crashes that occurred within 25 feet of where bicycle infrastructure exists today resulted in a KA injury. The push to build out a network of safe, comfortable, and convenient bicycle infrastructure is an effective strategy to reduce the number of crashes that result in a serious injury or fatality.

Another important takeaway from the safety analysis performed in this plan is that, within the City of Worcester, REJ+ designated census block group geographies are more dangerous areas to bicycle in than census block groups without an REJ+ designation, as measured by both frequency of crashes and crash severity. Out of 489 bicycle crashes that occurred in Worcester between 2012 and 2021, 470 (96.1%) occurred inside or within 25 feet of a census block group with an REJ+ designation. All 25 KA bicycle crashes that occurred in the City of Worcester occurred inside or within 25 feet from a census block

group with an REJ+ designation. While the KA crash rate was higher for census block groups without an REJ+ designation than those with an REJ+ designation, this can be explained by higher motorist speeds in suburban and rural areas, as well as the lower total number of bicycle crashes in census block groups without an REJ+ designation.

An analysis of both historical crash data and contextual data like roadway characteristics, land use, and demographics can provide insights pertaining to high-risk locations and serve as a guide for future investment. This procedure is demonstrated in Worcester's Vision Zero Plan. Thorough analysis of crashes, contextual data, and community input helped Worcester determine a priority network; 56% of Worcester's severe and fatal crashes occurred on just 7% of Worcester Streets.⁴⁷ The resulting high priority network serves as a tool for prioritizing safety improvement investments.

CMMPO staff laid groundwork for municipalities to be able to examine their respective communities in a new way. A detailed and nuanced understanding of crashes can play a direct role in determining how to apply the Safe Systems Framework and which type of safety countermeasure would be most effective in a particular context. The FHWA's Crash Modification Factor (CMF) Clearinghouse is an invaluable resource for applying specific safety countermeasures to specific contexts. In addition, the Highway Safety Manual (HSM), published by the American Association of State Highway Transportation Officials (AASHTO), is the authoritative source on information and tools to facilitate roadway design and operational decisions based on their safety consequences. The CMF Clearinghouse includes all CMFs listed in the HSM.

⁴⁷ City of Worcester, Vision Zero Plan Appendices, page 106. 2025

Access to Destinations Analysis

Introduction

The analysis in the previous Regional Bicycle Plan, released by the CMMPO in 2018, focused on network completeness as a measure of network connectivity. The identification of the current network and the gaps in the network helped inform regional, major, and minor priorities. The connectivity analysis performed in this plan is intended to augment the previous analysis by focusing on access to destinations and Level of Traffic Stress (LTS). It is important to know what a built-out regional network could look like; however, it is essential to incorporate an analysis that considers the destinations that people want or need to travel to. An examination of the stress tolerance required to ride a bicycle on each roadway segment in a particular community can help identify priorities to actualize well-connected, low-stress bicycle networks that not only connect people to destinations but also appeal to a broad portion of the population.

An important part of this plan examines common destinations and how accessible these destinations are by bicycle. Staff of the CMMPO utilized the Service Area Network Analyst tool in ArcGIS Pro to create travel time buffer polygons, or travelsheds, around common destinations. These travelsheds show the area that can be reached from a specific location (in this case, a common destination) in a specified amount of time. The Service Area Network Analyst tool relies on a large network dataset containing detailed information about the transportation network in order to calculate travel times, and in turn, create the travelsheds. By incorporating Bicycle Level of Traffic Stress (LTS) values into the travelshed analysis, CMMPO staff could more easily identify priority segments for improved bicycle infrastructure that would be most impactful on the overall low-stress bicycle network and connect people to common destinations.

Bicycle Level of Traffic Stress (LTS)

Level of traffic stress (LTS) is an approach that quantifies the amount of discomfort people feel when they ride a bicycle close to traffic. The LTS methodology applies a numeric value to roadway segments and trails to quantify stress level based on attributes such as traffic speed, traffic volume, number of lanes, presence of bicycle facilities, type of bicycle facilities, frequency of parking turnover, ease of intersection crossings, presence and

number of conflict points, and more. The LTS methodology relies on a “weakest link” logic; even if many attributes of a roadway indicate low stress, if one attribute indicates high stress, that segment will be categorized as high stress. In other words, the LTS rating assigned to a roadway segment is determined by its most stressful link. The level of traffic stress of a roadway segment is quantified 1 through 4, roughly corresponding to the four bicycle user types outlined on Page 13:

LTS 1: Very low stress, suitable for most children.

LTS 2: Low traffic stress, suitable for the Interested but Concerned bicycle user type.

LTS 3: Moderate traffic stress, suitable for the Enthused and Confident bicycle user type.

LTS 4: High stress, suitable for only the Strong and Fearless bicycle user type.

When a roadway segment has a moderate or high level of traffic stress, it may be a sign that dedicated bicycle infrastructure is needed to make it a place where more people will feel comfortable riding a bicycle. The town maps displaying Bicycle LTS in the Technical Appendix are an invaluable tool for planning low stress bicycle routes. These maps were made using the MassDOT statewide bicycle LTS data layer. The LTS maps can also be used to identify gaps in bicycle networks. For a bicycle network to attract the broadest segment of the population, it must provide low-stress connectivity on roadways or off-road bicycle paths that are LTS 2 or lower.

Isochrone Buffers: Bicycle Travelsheds

Methodology

As stated, CMMPO staff utilized ArcGIS Pro to conduct the connectivity analysis portion of the Regional Bicycle Plan. The first step in performing the access to destinations connectivity analysis was to decide which destinations would be used in the analysis and obtain the relevant data layers. With assistance from the Bicycle Plan Advisory Committee, it was determined that the following destinations would be ideally suited for the analysis: town & city halls, schools, libraries, and food retailers. United States Census population data at block group level and Replica HQ bicycle trip origin data at the census block group level was used to understand and represent trip origins. The following data layers were obtained from the following sources:

- Town & City Halls from the CMMPO GIS database
- Schools from the CMMPO GIS database
- Libraries from the CMMPO GIS database
- SNAP Retailer Locations from U.S. Department of Agriculture (USDA)
- Farmers' Market Locations from MassGIS
- Bicycle Facilities (Existing and Planned) from MassDOT's GeoDOT Open Data Portal
- Population data from the U.S. Census Bureau
- Bicycle trip origin data from Replica HQ
- Bicycle Level of Traffic Stress (LTS) from MassDOT
- Jobs Proximity Index from U.S. Department of Housing and Urban Development (HUD)

Once all the necessary data layers were obtained and added to a map in ArcGIS Pro, several geoprocessing tools were utilized to conduct the analysis. The Service Area Network Analyst Tool was utilized to create 5-, 10-, and 15-minute bicycle travelsheds. CMMPO staff modified the travel mode settings to reflect the average bicyclist in Central Massachusetts. Parameters for this travel mode are as follows:

- **Maximum vehicle speed:** 14.4841 kilometers/hour, which equals 9 miles/hour.
- **Restrictions:** Avoid Carpool Roads, Express Lanes, Ferries, Gates, Limited Access Roads, Private Roads, Stairways, and Toll Roads.

The following additional travel settings were set to determine the area of service towards destinations, as CMMPO staff wanted to determine areas within 5-, 10-, and 15-minute bicycle rides from common destinations. Direction of analysis was set to "Toward Facilities." Once CMMPO staff ran the analysis, resulting isochrone buffers were created which represent the areas serviced by the destinations, or travelsheds.

Priority Identification and Scoring

To identify priority roadway segments, CMMPO staff used a Select by Location query to identify high-stress road segments (LTS Rating 3 or 4) that intersect the 5-minute travelshed of destinations. These segments represent barriers to a well-connected, low-stress bicycle network, and thus represent priorities for actualizing a low-stress bicycle network that connects people to destinations. Through this process, 327 roadways were identified as priorities. To score these priorities, CMMPO staff employed a 12-factor scoring rubric. The

chart below shows the factors included in our scoring rubric, the category each factor falls into, and the weighting assigned to each category. The safety-related factors received the most significant weight at 40%, comfort & access-related factors received the second-most significant weight at 30%, and the remaining categories received 10% weight, as these factors were important to take into consideration, but not considered as important as the safety and comfort & access related factors.

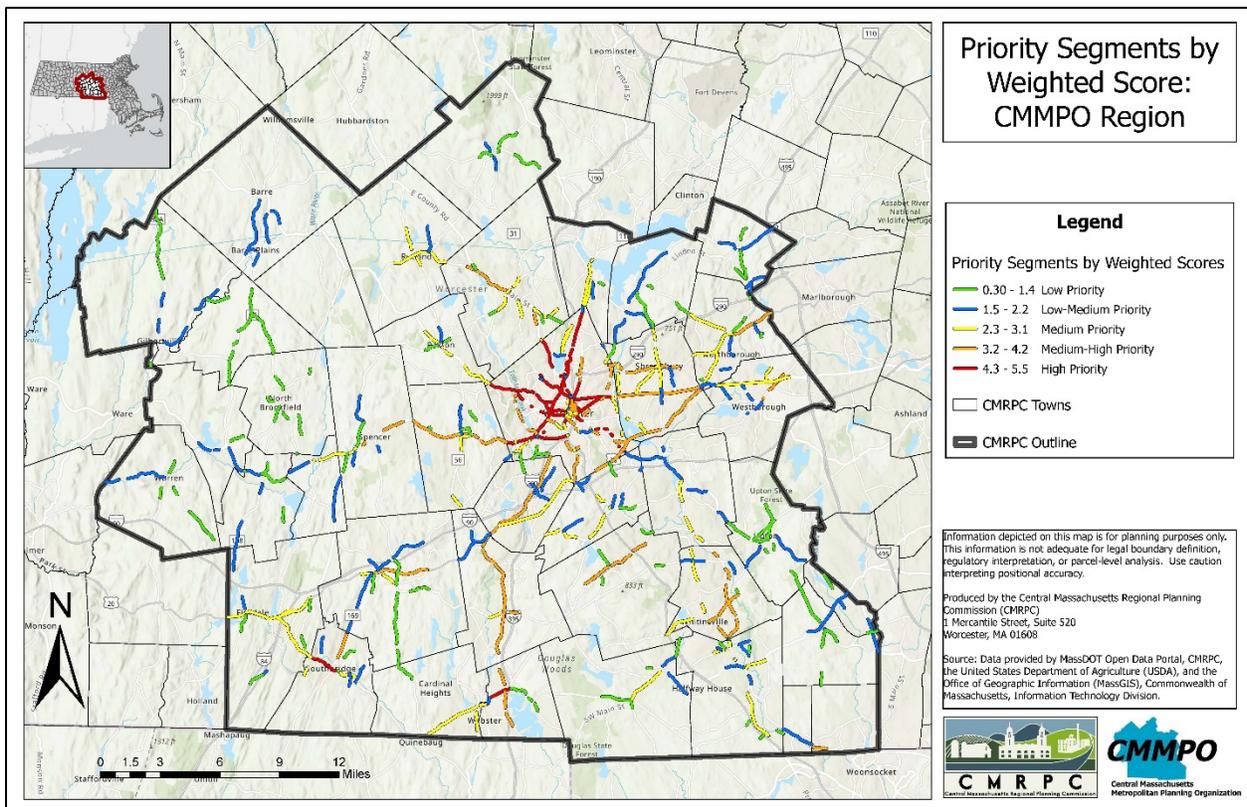
Chart: Priority Roadway Scoring Rubric

Factor	Category	Weight
Crash-Based Analysis	Safety	40%
Risk-Based Analysis		
MassDOT VRU Assessment		
Level of Traffic Stress Rating	Comfort & Access	30%
Number of Bicycle Trip Origins (Census Block Group)		
Interactive Map/Survey	Public Participation	10%
Mention in Other Local Survey		
State Priority	State, Regional, and Local Priority Determination	10%
Regional Priority		
Local Priority		
Population (Census Block Group)	Socioeconomic & Demographic	10%
REJ+ Determination (Census Block Group)		

Results

The map below shows the results of the prioritization process. The results are also packaged in the form of Town maps and tables in the Technical Appendix. The priority identification process resulted in 327 roadways being identified as priorities. Once scored, it was revealed that 16 out of the top 20 priorities were located in Worcester. Notably, 2 priorities outside Worcester scored particularly high: Main Street in Southbridge and East Main Street in Webster.

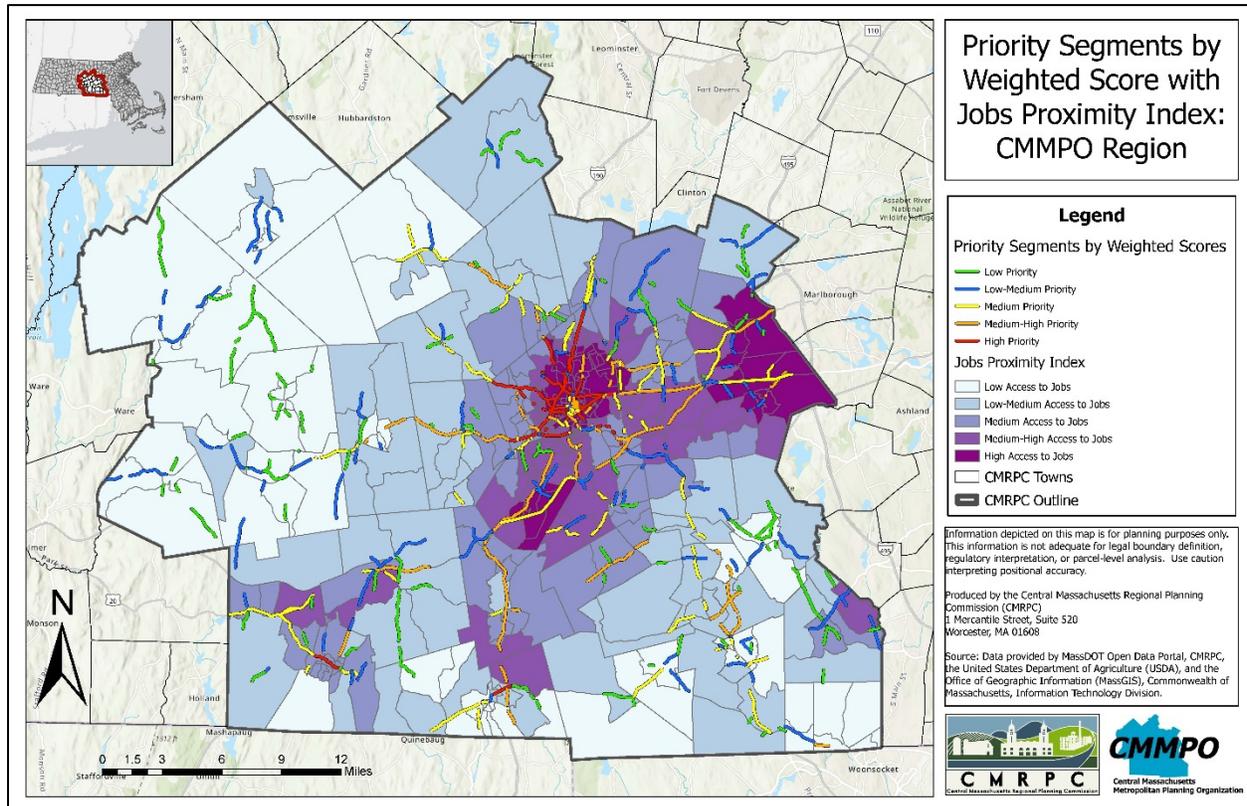
Prioritization Results: Priority Roadways by Weighted Score



The map below shows the priority roadways with the U.S. Department of Housing and Urban Development (HUD) Jobs Proximity Index. The Jobs Proximity Index quantifies accessibility to jobs/employment at the Census Block Group level. Notably, there is high access to jobs within the City of Worcester, where many of the top priorities identified in this plan are located. Other areas with high access to jobs include the MA-Route 9 corridor

east of Worcester, as well as the US-Route 20 corridor in Auburn, Charlton, and Sturbridge. Local communities may consider priority roadways that improve multimodal access to jobs, even if they score lower than other priority roadways in the Bicycle Plan prioritization process.

Prioritization Results: Priority Roadways with Jobs Proximity Index



List of Priorities

The table below shows all 327 identified priority roadways. Due to the nature of the Road Inventory File (RIF) and the Level of Traffic Stress (LTS) Ratings, several identified priority roadway segments were isolated; in other words, intermittent portions of a roadway may have been selected through the methodology, while other portions of that same roadway were not selected. For these reasons, CMMPO staff considered the entire roadway a priority, not just isolated segments of that respective roadway. This aligns with the “weakest link” logic of the LTS methodology and promotes greater connectivity throughout the region. As such, detailed “to and from” extents are not specified in the priority list.

2025 REGIONAL BICYCLE PLAN

Town	Roadway (Street Name)	Calculated Weighted Score
Auburn	Southbridge Street	3.6
Auburn	Washington Street	3.1
Auburn	Auburn Street	2.2
Auburn	Oxford Street North	2.2
Auburn	Brotherton Way	1.9
Auburn	Millbury Street	1.8
Auburn	Pakachoag Street	1.7
Auburn	Pinehurst Avenue	0.7
Barre	Worcester Road	1.9
Barre	South Street	1.7
Barre	North Brookfield Road	1.6
Barre	South Barre Road	1.6
Barre	Wheelwright Road	1.6
Berlin	Central Street	2.2
Berlin	River Road West	2
Berlin	West Street	1.7
Berlin	Coolidge Road	1.5
Berlin	Whitney Road	1.5
Berlin	Highland Street	1.3
Berlin	Pleasant Street	1.2
Berlin	South Street	1.2
Blackstone	Main Street	3.7
Boylston	Main Street	2
Boylston	Shrewsbury Street	1.7
Boylston	Central Street	0.9
Boylston	School Street	0.6
Brookfield	Fiskdale Road	1.5
Brookfield	West Main Street	1.5
Brookfield	South Maple Street	1.4
Brookfield	North Brookfield Road	1.3
Brookfield	East Main Street	1.2
Brookfield	Post Road	1
Brookfield	Main Street	0.9
Brookfield	Lake Road	0.8
Charlton	Worcester Road	3.5
Charlton	Sturbridge Road	2.4
Charlton	Masonic Home Road	2.3
Charlton	Brookfield Road	2
Charlton	Southbridge Road	2
Charlton	Stafford Street	1.7
Charlton	Center Depot Road	1.3
Charlton	Carpenter Hill Road	1.2
Charlton	Dresser Hill Road	1.1

2025 REGIONAL BICYCLE PLAN

Town	Roadway (Street Name)	Calculated Weighted Score
Charlton	North Main Street	1.1
Charlton	Muggett Hill Road	0.8
Charlton	Oxford Road	0.8
Douglas	Main Street	2.8
Douglas	Gilboa Street	1.9
Douglas	Davis Street	1.7
Douglas	Manchaug Street	1.3
Douglas	Webster Street	0.9
Douglas	South Street	0.5
Dudley	West Main Street	2.6
Dudley	Schofield Avenue	2.4
Dudley	Dresser Hill Road	0.8
East Brookfield	East Main Street	2.5
East Brookfield	West Main Street	1.7
East Brookfield	Podunk Pike	1.6
Grafton	Providence Road	3.1
Grafton	Worcester Street	2
Grafton	North Main Street	1.7
Grafton	Upton Street	1.7
Hardwick	Lower Road	2
Hardwick	Hardwick Road	1.8
Hardwick	Barre Road	1.7
Hardwick	Petersham Road	1.3
Holden	Main Street	4.2
Holden	Highland Street	2.4
Holden	Reservoir Street	2.4
Holden	Shrewsbury Street	2.4
Holden	Salisbury Street	2.3
Holden	Doyle Road	1.4
Holden	Holden Street	1.4
Holden	South Road	1.4
Holden	Broad Street	1
Hopedale	Hopedale Street	1.9
Hopedale	Mendon Street	1.9
Hopedale	South Main Street	1.6
Hopedale	Dutcher Street	1.1
Leicester	Main Street	4
Leicester	South Main Street	2.8
Leicester	Pleasant Street	2.5
Leicester	Paxton Street	2.2
Leicester	Stafford Street	1.7
Leicester	Soojians Drive	1.4
Leicester	Mannville Street	1.3

2025 REGIONAL BICYCLE PLAN

Town	Roadway (Street Name)	Calculated Weighted Score
Leicester	Winslow Avenue	1.3
Mendon	Hastings Street	2.1
Mendon	Uxbridge Road	2.1
Mendon	Main Street	1.9
Mendon	Cape Road	1.8
Mendon	Milford Street	1.7
Mendon	North Avenue	1.4
Mendon	Providence Street	1
Mendon	Blackstone Street	0.7
Mendon	Hartford Avenue East	0.7
Millbury	North Main Street	3.1
Millbury	Elm Street	2.9
Millbury	West Main Street	2.3
Millbury	Grafton Road	2.1
Millbury	Howe Avenue	1.9
Millbury	Southwest Cutoff	1.9
Millbury	Carleton Road	1.5
Millbury	Greenwood Street	1.5
Millbury	Riverlin Street	1.5
Millbury	Grafton Street	1.4
Millbury	Millbury Avenue	1.2
Millville	Main Street	1.7
New Braintree	Ware Road	1.3
New Braintree	Barre Cut Off Road	1.2
New Braintree	Barre Road	1.2
New Braintree	Hardwick Road	1.2
New Braintree	West Brookfield Road	1.2
North Brookfield	Oakham Road	1.4
North Brookfield	New Braintree Road	1.1
North Brookfield	East Brookfield Road	1
North Brookfield	Bigelow Street	0.8
North Brookfield	South Main Street	0.7
North Brookfield	West Brookfield Road	0.7
North Brookfield	Old East Brookfield Road	0.3
Northborough	Main Street	3.6
Northborough	Church Street	3.1
Northborough	West Main Street	2.8
Northborough	Southwest Cutoff	2.4
Northborough	Davis Street	2
Northborough	South Street	2
Northborough	Belmont Street	1.6
Northborough	Hartford Turnpike	1.6
Northborough	Bartlett Street	1.5

2025 REGIONAL BICYCLE PLAN

Town	Roadway (Street Name)	Calculated Weighted Score
Northborough	Northborough Crossing	1.2
Northborough	Ramp-Route 9 WB to Route 20 EB	1.2
Northborough	Hudson Street	1.1
Northborough	Solomon Pond Road	1
Northborough	Lyman Street	0.8
Northborough	Pierce Street	0.3
Northbridge	Providence Road	4.2
Northbridge	Linwood Avenue	3.6
Northbridge	Church Street	3.3
Northbridge	Main Street	2.8
Northbridge	Hill Street	2.6
Northbridge	School Street	1.6
Northbridge	Sutton Street	1.6
Northbridge	Quaker Street	1.3
Oxford	Main Street	4.2
Oxford	Sutton Avenue	3.2
Oxford	Charlton Street	2.8
Oxford	Southbridge Road	2.1
Oxford	Leicester Street	1.9
Paxton	Pleasant Street	2.4
Paxton	Richards Avenue	1.5
Paxton	West Street	1.3
Paxton	Grove Street	1.2
Paxton	Maple Street	1.2
Princeton	Mountain Road	1.9
Princeton	Worcester Road	1.5
Princeton	Sterling Road	1.3
Princeton	East Princeton Road	1.1
Princeton	Hubbardston Road	0.9
Rutland	Main Street	2.7
Rutland	E County Road	2.4
Rutland	Maple Avenue	2.4
Rutland	Pommogussett Road	2.3
Rutland	Glenwood Road	1.9
Shrewsbury	Boston Turnpike	3.7
Shrewsbury	Main Street	3.6
Shrewsbury	Hartford Turnpike	3.2
Shrewsbury	Maple Avenue	2.7
Shrewsbury	South Quinsigamond Avenue	2.7
Shrewsbury	Crafton Street	2.4
Shrewsbury	North Quinsigamond Avenue	2.4
Shrewsbury	Boylston Street	2.3
Shrewsbury	Lake Street	2.3

2025 REGIONAL BICYCLE PLAN

Town	Roadway (Street Name)	Calculated Weighted Score
Shrewsbury	Memorial Drive	2
Shrewsbury	South Street	1.9
Shrewsbury	Grafton Circle	1.7
Shrewsbury	Clinton Street	1.3
Southbridge	Main Street	4.6
Southbridge	Worcester Street	3.6
Southbridge	South Street	2.5
Southbridge	East Main Street	2.3
Southbridge	Dresser Hill Road	2.2
Southbridge	North Woodstock Road	2.2
Southbridge	Sandersdale Road	1.9
Southbridge	Pleasant Street	1.8
Southbridge	Guelphwood Road	1.4
Southbridge	Southbridge Rotary	1
Spencer	Main Street	3.6
Spencer	West Main Street	2.7
Spencer	Maple Street	1.9
Spencer	South Spencer Road	1.8
Spencer	Pleasant Street	1.7
Spencer	North Spencer Road	1.6
Spencer	Meadow Road	1.4
Spencer	Podunk Pike	1
Sturbridge	Main Street	2.8
Sturbridge	Charlton Road	2.5
Sturbridge	Brookfield Road	1.5
Sturbridge	Haynes Street	1.5
Sturbridge	Fiske Hill Road	1.3
Sturbridge	Mashapaug Road	1.1
Sturbridge	Holland Road	0.7
Sutton	Boston Road	3.3
Sutton	Providence Road	1.4
Sutton	Central Turnpike	1.1
Sutton	Singleary Avenue	0.8
Sutton	Putnam Hill Road	0.7
Upton	Milford Street	1.8
Upton	Pleasant Street	1.6
Upton	Grove Street	1.3
Upton	West Main Street	1.3
Upton	Hartford Avenue	1.1
Upton	Hopkinton Road	1.1
Upton	Mendon Street	1.1
Upton	High Street	0.8
Upton	Main Street	0.8

2025 REGIONAL BICYCLE PLAN

Town	Roadway (Street Name)	Calculated Weighted Score
Upton	Westboro Road	0.8
Upton	School Street	0.5
Uxbridge	Mendon Street	3
Uxbridge	Hartford Avenue West	2.7
Uxbridge	North Main Street	2.6
Uxbridge	Quaker Highway	2.5
Uxbridge	South Main Street	1.8
Uxbridge	Douglas Street	1.7
Uxbridge	Hartford Avenue East	1.6
Uxbridge	Providence Road	1.6
Uxbridge	Granite Street	1.5
Uxbridge	Sutton Street	1.5
Uxbridge	Oak Street	1.2
Uxbridge	Rivulet Street	1.2
Uxbridge	Aldrich Street	0.8
Uxbridge	Elmwood Avenue	0.8
Uxbridge	Ironstone Road	0.8
Uxbridge	River Road	0.8
Uxbridge	Lackey Dam Road	0.8
Warren	Main Street	2
Warren	Southbridge Road	1.4
Warren	Brimfield Road	1.3
Warren	Old West Brookfield Road	1.1
Webster	East Main Street	4.6
Webster	Worcester Road	3.4
Webster	Thompson Road	3.2
Webster	Main Street	2.7
Webster	South Main Street	2.1
Webster	Gore Road	1.3
Webster	Douglas Road	0.9
Webster	Lower Gore Road	0.4
West Boylston	West Boylston Street	3
West Boylston	Worcester Street	2.3
West Boylston	Maple Street	1.5
West Boylston	Temple Street	1.2
West Brookfield	East Main Street	2.1
West Brookfield	West Main Street	2.1
West Brookfield	North Main Street	1.4
Westborough	East Main Street	3.8
Westborough	Lyman Street	2.8
Westborough	Turnpike Road	2.5
Westborough	West Main Street	2.2
Westborough	Main Street Rotary	1.8

2025 REGIONAL BICYCLE PLAN

Town	Roadway (Street Name)	Calculated Weighted Score
Westborough	Otis Street	1.7
Westborough	Milk Street	1.6
Worcester	Park Avenue	5.5
Worcester	Main Street	5.3
Worcester	Grove Street	5.2
Worcester	Grafton Street	5.2
Worcester	Chandler Street	5.1
Worcester	Salisbury Street	5.1
Worcester	Shrewsbury Street	5.1
Worcester	Lincoln Street	5.1
Worcester	Cambridge Street	5
Worcester	Belmont Street	4.9
Worcester	Southbridge Street	4.9
Worcester	West Boylston Street	4.9
Worcester	Gold Star Boulevard	4.8
Worcester	Highland Street	4.7
Worcester	Pleasant Street	4.5
Worcester	East Central Street	4.4
Worcester	Franklin Street	4.2
Worcester	Madison Street	4.2
Worcester	Millbury Street	4.1
Worcester	Vernon Street	3.9
Worcester	Mill Street	3.7
Worcester	Burncoat Street	3.6
Worcester	McKeon Road	3.6
Worcester	Foster Street	3.5
Worcester	Kelley Square	3.5
Worcester	Martin Luther King Jr Boulevard	3.5
Worcester	May Street	3.5
Worcester	Plantation Street	3.5
Worcester	Summer Street	3.5
Worcester	Southwest Cutoff	3.4
Worcester	Greenwood Street	3.3
Worcester	Major Taylor Boulevard	3.3
Worcester	Massasoit Road	3.2
Worcester	Millbrook Street	3.2
Worcester	Mountain Street West	3.2
Worcester	Sunderland Road	3.2
Worcester	Boylston Street	3.1
Worcester	Frontage Road North	3
Worcester	Myrtle Street	3
Worcester	Church Street	2.8
Worcester	Front Street	2.8

2025 REGIONAL BICYCLE PLAN

Town	Roadway (Street Name)	Calculated Weighted Score
Worcester	Goddard Memorial Drive	2.8
Worcester	Quinsigamond Avenue	2.8
Worcester	Stafford Street	2.8
Worcester	Francis J McGrath Boulevard	2.7
Worcester	Frontage Road South	2.7
Worcester	Mountain Street East	2.7
Worcester	Lancaster Street	2.6
Worcester	Blackstone River Road	2.5
Worcester	Lake Avenue	2.5
Worcester	Elm Street	2.4
Worcester	James Street	2.4
Worcester	Winthrop Street	2.4
Worcester	Hammond Street	2.3
Worcester	Washington Square	2.3
Worcester	Shore Drive	2.1
Worcester	Elm-Maple Connector	2
Worcester	Mill Street Extension	2
Worcester	Northeast Cutoff	2
Worcester	State Road	1.8
Worcester	Flagg Street	1.7
Worcester	Woodbury Street	1.6
Worcester	Heywood Street	1.5
Worcester	Lexington Street	1.5
Worcester	Webster Street	1.3
Worcester	South Ludlow Street	1.2
Worcester	Hope Avenue	0.7

Limitations and Future Analysis

Limitations

The identification and scoring of priorities in this plan places particular emphasis on both safety and a well-connected, low-stress bicycle network. As such, the resulting priorities serve the specific goals outlined in the introduction of this plan, and strive to advance the vision of 2050 Connections, the CMMPO Long-Range Transportation Plan (LRTP). Certain aspects of the analysis in this plan could be adjusted to serve other planning goals. For example, other destinations could have been taken into consideration, such as parks, recreational areas, or high-density employment areas. While the priorities identified in this plan are shown with the U.S. Department of Housing and Urban Development's Jobs Proximity Index to see how the priorities overlap with high-density employment areas, proximity to high-density employment areas was not a factor in the scoring of the priorities.

Replica HQ Bicycle Data

To incorporate trip origins into the access to destinations analysis, CMMPO staff utilized data from Replica HQ at the Census Block Group level. For data related to the bicycle mode, Replica HQ models utilize data from applications like OpenStreetMap and Strava, where users can log trips. Replica considers this data medium level certainty, as there is a relatively low total number of total bicycle trips in the CMMPO region. As such, Replica HQ states that the data is valid and can be utilized as a good use case; however, it is important to understand the limitations. It is valuable to incorporate this data into our access to destinations analysis, but it is also essential to understand that the data becomes more accurate with a larger sample size. The relatively low sample size for the CMMPO region causes the level of certainty to be rated medium. Further, bicycle users without smartphones may not be included in Replica HQ's bicycle trip data. To account for this, CMMPO staff incorporated a measure that captures potential bicycle trip origins and general potential for everyday bicycling; population at the Census Block Group level was included as a factor in the scoring rubric.

Future Analysis

An interesting way to augment this analysis would be to create a custom, localized network dataset to perform the isochrone buffer analysis. Several different edits could be made to the network dataset to tailor analysis to different goals. For example, running the Service Area Network Analyst tool using only roadways with a Level of Traffic Stress (LTS) rating of 2

or below could show travelshed polygons where travel is only permitted on the low-stress network. This could help create travelsheds using only roadways that are comfortable to ride a bicycle on for the interested but concerned bicycle user type, representing a large portion of the population. These low stress travelsheds could give a realistic view of the current state of bicycle accessibility, and subsequent analysis could reveal critical connectivity points for improved infrastructure.

Municipal Resources and Funding Sources

Municipal Resources

This plan includes a list of resources that municipalities can utilize and reference when working to improve the bicycle infrastructure in their respective communities. This list is comprised of various documents that include guidelines for many different aspects of a robust active transportation network, with a focus on bicycle infrastructure. The CMMPO region is a diverse region, and the following list of resources is intended to be diverse as well; indeed, some resources may be more relevant than others based on the characteristics of each community in the region. Additionally, a comprehensive table of funding sources for active transportation projects is included. As with the list of municipal resources, the list of funding sources is intended to be broad and inclusive, in order to connect communities with as many funding sources as possible.

Glimpse of Current Funding Landscape

The following federal and state discretionary funding sources are included in a comprehensive funding sources table in the Technical Appendix; however, they are also included here to give a sense of the current funding landscape for improving active transportation safety in Massachusetts.

[Safe Streets for All \(SS4A\)](#)

This grant program is administered by the USDOT and is focused on achieving zero roadway fatalities. This program focuses on the development of a comprehensive safety action plan and its implementation for all users, including bicyclists, pedestrians, public transportation users, motorists, commercial vehicle operators, and micromobility users. While this program is not limited to active transportation projects, utilizing a holistic approach to roadway safety is essential for reducing roadway fatalities to zero.

[Safe Routes to School \(SRTS\)](#)

Administered by MassDOT, this federally funded program strives to increase safe walking, biking, and rolling among elementary, middle, and high school students by using a collaborative, community-focused approach that bridges the gap between health and transportation.

[Shared Streets and Spaces](#)

This program is available for municipalities to help them meet their needs for more and safer outdoor recreation, commerce, mobility, and community activities. This program is designed to support quick-launch, quick-build projects.

[Complete Streets Program](#)

The Complete Streets Program provides funding for projects that accommodate all users of the transportation network, including pedestrians, bicyclists, micromobility users, transit users, and motorists. To be eligible for Complete Streets funding, communities must adopt a Complete Streets Policy and develop a prioritization plan.

[Active Transportation Infrastructure Investment Program \(ATIIP\)](#)

This large-scale federal program is available to states, multistate groups, or local/regional governmental organizations (MPOs or COGs). The competitive grant is awarded to help communities plan, design, and construct safe and connected active transportation networks that connect destinations within a community. Other eligible projects include trails, pedestrian facilities, or bikeways that serve as backbones to connect two or more communities, metropolitan regions, or states.

[Better Utilizing Investments to Leverage Development \(BUILD\) Program](#)

This U.S. Department of Transportation (USDOT) program provides grants for surface transportation infrastructure projects with significant regional or local impact. Multi-modal projects that may be more difficult to fund through other grant programs could be eligible for this program.

General Recommendations, Strategies & Future CMMPO Initiatives

Engineering, education, enforcement, encouragement, and evaluation are considered “the five Es” of transportation safety planning. They were originally intended to provide increased continuity between past, present, and future transportation planning projects and provide guidance and consistency across the CMMPO region and throughout the Commonwealth. While the five Es of transportation safety planning have in large part been replaced by Vision Zero and the Safe Systems Approach, the essence remains the same: emphasize a holistic approach to transportation planning. The following list of general recommendations, strategies, and initiatives is intended to compliment the materials in the Appendices to provide our member communities with useful and robust planning tools.

Engineering-related recommendations/initiatives:

- The CMMPO and member municipalities should work together, in coordination with MassDOT, to ensure that any new bicycle infrastructure in the region follows current best practices and guidelines.
- The CMMPO should work with MassDOT and the UMass Transportation Center to continue to provide and highlight training opportunities for municipal staff such as engineering, planning, and local law enforcement.
- Increase the number of bicycle parking facilities in municipalities throughout the CMMPO region.
- Increase on-road bicycle connections to public open space to provide opportunities for travel to and from recreational spaces.
- Explore the possibility of a region-wide wayfinding signage that improves bicycle commuting opportunities as well as recreational bicycling, including travel and tourism.
- The CMMPO should continue to seek opportunities to provide additional end-of-trip facilities such as parking, bathrooms, showers, lockers, water stations, seating, lighting, and more. There are opportunities for public/private partnerships with larger employers in the region to provide these facilities.
- The CMMPO should continue to collaborate with neighboring MPOs and MPOs throughout the state to ensure inter-region connectivity, consistency, and continuity.
- Explore the use of road diets to create space for bicycle infrastructure and increase safety for motorists, bicyclists, and pedestrians.

Education-related recommendations/initiatives:

- MassDOT should coordinate with the Registry of Motor Vehicles (RMV) to disseminate training materials through driver training courses.
- Continue to utilize the following methods of campaigning throughout the region: newspaper & newsletter articles, online blog posts, social media posts, Municipal, State, and employer websites, utility bill inserts, and public service announcements on transit, television, radio, billboards, and other forms of print media.
- Incorporate safety education into regularly distributed materials, such as tax bills, registration renewals, or other town-issued communications.
- The CMMPO should continue to coordinate with Safe Routes to School (SRTS) staff and local schools to increase SRTS program participation, helping to promote educational opportunities in schools and summer recreation programs.
- The CMMPO should continue to work with stakeholders to promote the use of Traffic Gardens as a tool for educating the public on how to safely get around their communities.

Enforcement-related recommendations/initiatives:

- Regular training for law enforcement officers on bicycle related issues, especially traffic laws, regulations, and “Share the Road” campaign.
- Encourage police officers to use targeted enforcement, similar to the MassDOT Safety Grant employed by the Worcester Police Department in 2016, to encourage motorists, bicyclists, and pedestrians to share the road in order to promote safety for all.
- Local law enforcement should continue to participate in community engagement events, including school and car seat safety programs.
- Increase bicycle police patrols, especially in areas with high levels of bicycle traffic or where safety concerns have been identified.
- Worcester-specific enforcement recommendations:
 - Develop and complete an interagency agreement between Worcester Police Department (WPD) and the Department of Transportation and Mobility (DTM).
 - Regular monthly meetings and coordination between WPD traffic enforcement and DTM.
- Adopt MassDOT “crash,” not “accident” terminology.

- Continue crossing guard training in conjunction with Worcester Public Schools (WPS).
- Convert WPD citations from paper to digital format.
- Encourage WPD to be messengers for Vision Zero through public relations campaigns.

Encouragement-related recommendations/initiatives:

- Provide incentives for local businesses and larger employers to promote bicycle friendliness to their employees, customers, and clients.
- Municipalities, employers, and universities can participate in events, such as Baystate Bike Week, Open Street events, and community rides.
- Implement improved wayfinding and signage throughout the CMMPO region, making it easier, safer, and more comfortable for people to navigate via bicycle.
- Explore the possibility of changes to local ordinances to require large employers, universities, and/or municipalities to provide end-of-trip facilities, such as sufficient bicycling parking, bathrooms, water stations, or even locker rooms/showers.
- Utilize transportation demand management (TDM) strategies to provide employees with more travel options, such as work location, route, time of travel, and mode of travel.

Evaluation-related recommendations/initiatives:

- Ensure that the proper data is collected before certain projects are implemented to have a detailed and accurate baseline for a particular location.
- Ensure that sufficient time and resources are devoted to the development of performance measures so that project proponents are using the correct performance measures.
- Work to develop effective informational campaigns using evaluation data and analysis to educate the public on what is happening in their community and why.
- Conduct and promote economic impact studies throughout the region to help demonstrate the benefits of a well-built bicycle network.

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